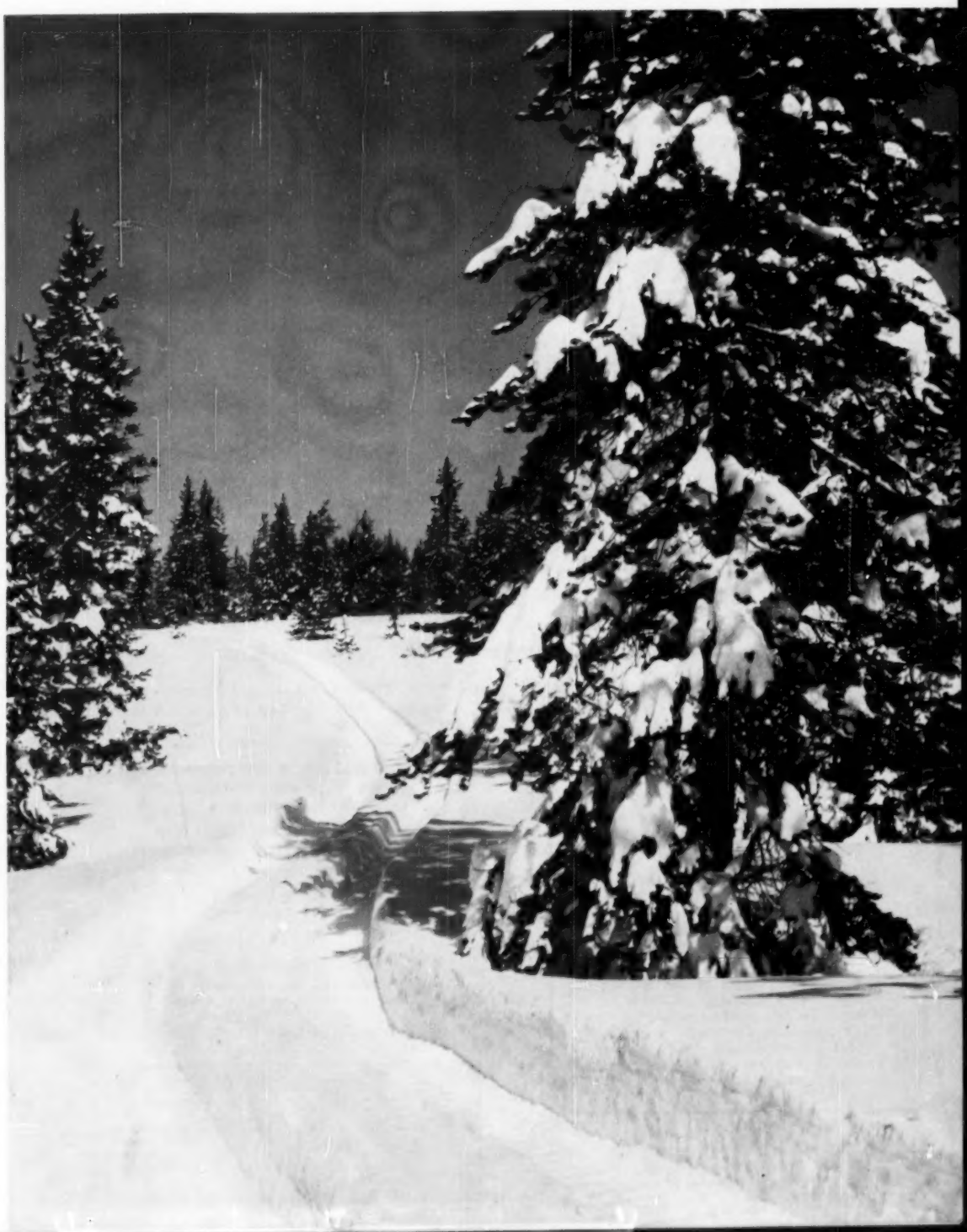
Journal of FORESTRY

DECEMBER 1955

Including Index



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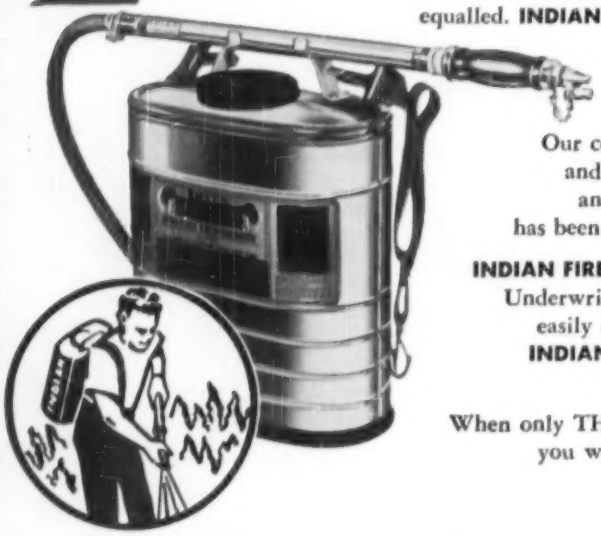

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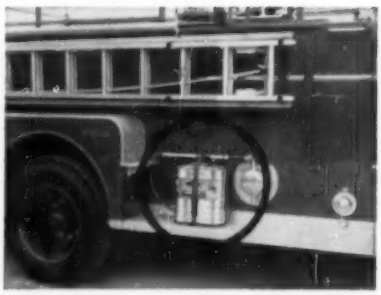

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Photo courtesy Soil Conservation Service, U. S. Dept. Agric.

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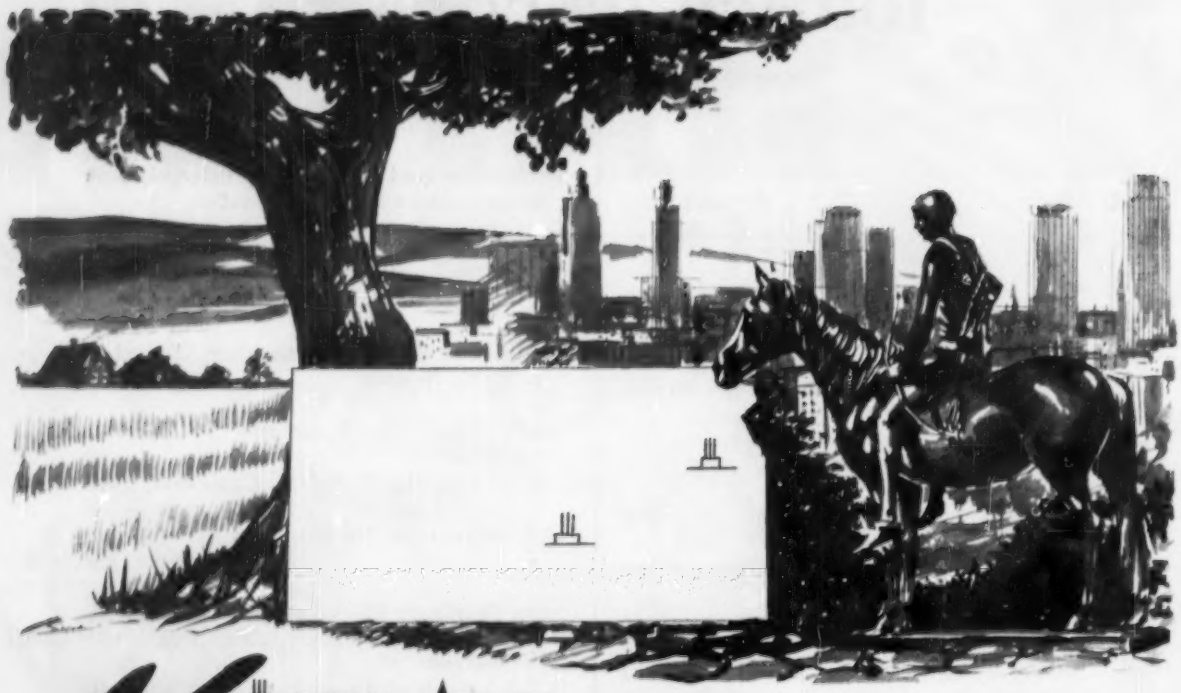

Kansas

. . . Agricultural and Geographical Center of the Nation

The leading state in wheat production, and containing within its boundaries the actual geographic center of the United States, — most of Kansas presents a landscape of rolling hills, creeks and valleys dotted with woodlands. Forests within the usually accepted meaning of the word are non-existent.

Probably the most widely distributed trees are the cottonwood, box elder and the willows. The cottonwood, designated as the state tree in 1937, is surpassed in economic value by the black walnut, the oaks, and the hickory. Also prominent are the elms, sycamore, hackberry and linden. Only one conifer,—the red cedar, —is native to the state.

The Osage orange, introduced in the early period as a substitute for fences, has become a menace in many of the pasturelands in the eastern third of the state.

In Kansas where emphasis on forestry is limited by the economic importance of open fields of wheat and pastureland,—and in highly forested areas alike, SOUTHERN GLO boundary paint offers distinct advantages to the woodland owner. One of the most positive identifications in use, its vivid mark resists extremes in temperature . . . remains clearly visible for years. It cannot be torn away as can paper tags, nor readily transferred as can aluminum ones. Nor can it be readily duplicated as can ordinary blaze marks. In cases of dispute, chemical analysis has distinguished between the original mark and a forgery.

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Journal of Forestry

Official Organ of the Society of American Foresters

Current Happenings in World Forestry[1]

Hardy L. Shirley
Dean, State University of New York,
College of Forestry, Syracuse

EFFORTS in international forestry began in 1893 with the establishment of the International Union of Forest Research Organizations. This union originally composed solely of European members but gradually spreading to encompass organizations in the United States and elsewhere, is still operative today. It has never had a substantial operating budget, hence its achievements have been due almost solely to what the member research organizations voluntarily agreed to carry out. Among its achievements are the international experiments on source of seed in Scotch pine and Norway spruce, an international bibliography of forest literature, technical considerations to be followed in the establishment of permanent and sample plots, and currently the preparation of a multilingual dictionary.

Two other international organizations failed to survive the Second World War: the Comité International du Bois was organized in Vienna in 1932 to collect and disseminate international timber statistics and to coordinate technical research on wood utilization. Following various vicissitudes during which the headquarters were changed from Austria to Brussels, the entire files of the organization were captured by the Germans. The latter never collaborated in the effort. The secretary fled to Switzerland and later to the United States. The Centre International de Sylviculture was organized by the Germans in May 1939. It succeeded in operating throughout the war and efforts were made to continue it in the post war period.

The most important international agency in forestry, however, was the International Institute of Agriculture in Rome which had a section on silviculture. This organization sponsored the first World Forestry Congress held in Rome in 1926, and the second Congress held in Budapest in 1936. During the Second World War its activities ceased and they were supplanted by the Food and Agriculture Organization of the United Nations established in 1943. In 1946 the forestry division of FAO came into being and it, in cooperation with the government of Finland, sponsored a Third World Forestry Congress held in Helsinki in 1949, and the Fourth World Forestry Congress, in cooperation with the government of India, held in 1954.

These are the chief international agencies that aspired to operate in the forestry field on a world-wide basis. There have been several other important international forestry efforts of which the Imperial Forestry Institute of Oxford, England, has been the most substantial. Its operations embrace the British Commonwealth of Nations. In recent years our own government has carried on a great deal of work in international forestry through the Point Four and other mutual assistance programs. It has also cooperated with the Food and Agriculture Organization in the latter's program of technical aid to various countries. Various regional organizations have also been operative such as the Northern Forestry Union embracing the Scandinavian countries, and Finland, various inter-American congresses and activities dealing with forestry in the Americas, and more recently the Colombo Plan embracing countries of southeast Asia.

One of the first tasks facing men concerned with international forestry is that of appraising accurately the importance of forests to the welfare of mankind. Man is basically a creature of the land. From the land he harvests the bulk of his plant and animal foods. He builds his home of stone, clay, or wood, clothes himself with plant or animal fibers, constructs roads over land on which he transports his goods. When he goes to sea it is in boats built of products of the land.

For more than a century man has been increasing in numbers and improving his standard of living, thereby placing progressively heavier demands on the land for products to sustain him. Knowing the resources of the earth's land surface to be finite, and knowing also that many current land practices are wasteful, people have expressed concern over the capacity of the land to provide sustenance for the growing millions of human beings. The products and services of forests loom large in any overall appraisal of the earth's productivity.

The total land area of the world is some 34 billion acres, made up roughly as follows:

Desert, arctic waste, semi-arid and brush land 48 percent.

Forest land 30 percent.

Agricultural land 22 percent.

Of the forest land more than

[1]Presented at the Sectional Meeting, Forest Products Research Society, held at Glens Falls, New York, April 28-29, 1955.

half is inaccessible for commercial timber operations. Only one-fourth, or 2½ billion acres is now used for some commercial timber. Furthermore, good forestry is practiced on no more than one-tenth the total forest area.

The Fourth World Forestry Congress dealt with five major subjects:

1. The present status of forest protection and forest management in the world.
2. The protective function of forests.
3. The productive function of forests.
4. Forest utilization.
5. Tropical forestry.

The entire morning session of each day was devoted to tropical forestry and the afternoon sessions to simultaneous meetings on the three major subjects of production, utilization, and forest influences.

The congress was opened by the President of India and by the Governor of Uttar Pradesh, the state in which Dehra Dun is located. The Indian Minister of Food and Agriculture took a prominent part throughout the congress. A total of over 358 delegates from some 47 different countries participated in the meeting. This was by far the broadest representation to participate in any forestry congress. Moreover the emphasis on tropical forestry and forests of semi-arid regions extended considerably the coverage in the field of forestry well beyond that of the earlier congresses.

Thanks to the gracious hospitality of the Indian people the delegates were entertained at many delightful receptions, plays, and other social events. Through these and the warm-hearted friendliness of the Indian people a spirit of tolerance and good will pervaded the congress. Devotion to international cooperation and to promoting peace among nations was an underlying theme throughout. The sessions were harmonious and delegates from widely separated lands developed warm friendships.

One may well ask: did the congress formulate clearly the major issues in world forestry today, and did it suggest measures for dealing with these in an effective manner? Actually it did neither. However, during the deliberations certain issues stood out and means of dealing with them were discussed. Among these issues were the following:

1. Inaccessible land.
2. Poor land practices.
3. Uninformed people.
4. Inadequate machinery.
5. Unfamiliar woods.
6. Tropical silviculture.
7. Inadequate transport.
8. Underdeveloped or obstructed trade channels.
9. Inadequate research.
10. Need for international statesmanship to promote sound long term use of the world's forest lands.

Obviously many of the above are not the responsibility of foresters alone but they do determine in large measure what foresters may accomplish.

1. Remote lands can be opened up only by government willingness that they be opened. Financing either from government or private sources is needed to build the necessary transportation system. Foresters can aid through providing an estimate of the forest wealth that can be made available for use if transportation systems are extended.

2. It is a personal observation that forest lands under the jurisdiction of foresters, whether they be in Turkey, India, Finland, or Trinidad, are well managed. A similar observation may be made about the better agricultural lands. The rice farmer in Kashmir, the sugar cane grower in the American tropics, the vegetable grower on Long Island, and the thrifty farmer of Denmark, all use relatively good agricultural methods. Wide differences exist in size of fields, machines in use, and the method of fertilizing, but the yields per acre tend to be fairly satisfactory. It is the lands in between the good agricultural lands and the forest lands managed by foresters on which destructive practices are most prevalent. Where the main draft animal is the burro and the main grazing animal is a goat, pasture management has usually reached the lowest level possible. It is on such lands where erosion is severe and floods frequent that great opportunities exist to increase further productivity. Many of these overexploited lands are accessible and serve as watersheds for irrigation, industrial, and municipal use. They badly need improvement and much can be done.

The congress dealt especially with the problems of dry land forestry and sought to focus the attention of the profession on a world-wide basis on this major issue.

3. Many forests of the world are inhabited by people with limited education. They follow shifting cultivation. They overgraze the forest lands, particularly the dry forest. They see little value in the forest itself because it is from their herds that they obtain their livelihood. Even in forests that are not subject to grazing the vast majority of forest users have little appreciation of the forest as an ecological entity and the care it must be given if it is to produce indefinitely valuable products and services for man. To this subject the congress also addressed its attention, particularly where grazing and agriculture meet the forest. It was recognized that we need in the profession men who understand agriculture and therefore can help the users of the forest to integrate agriculture and grazing with forestry.

4. In the Kashmir region of India one may see all phases of timber harvesting carried out with human labor alone. Limbing, felling, bucking, squaring the logs, and sawing the squared timber into heavy planks with hand saws, are all being done by human labor. In some operations peeled logs are skidded by a team of 11 men dragging the log by manpower alone. The introduction of modern machinery into an economy operating primarily on human and animal energy as sources of power is certain to cause serious maladjustments. How these can best be minimized is obviously of serious concern to every region undergoing

industrial development. Moreover, there is something even further to be considered. In regions where man has limited access to machine tools, he develops high skill in handicraft work. Certainly this is true of the Kashmir region where carved walnut boxes, trays, tables, and chests have an individual appeal unmatched by the best efforts of U. S. woodworking factories. Certainly man's artistic expression should not be stifled through introduction of factory methods in the handicraft society.

Loggers may be interested in the vigorous debate that occurred in the congress over the relative advantages of using tractors instead of elephants in forestry work. It was generally agreed that where logs are of modest size and bunching, decking and loading as well as skidding is involved, the elephant has his advantage, but where timbers must be skidded long distances the tractor clearly provides more economical power than the elephant.

5. Many tropical woods are relatively unknown except to the specialist and to the native people who live and work in the forest. Methods of seasoning, treating, and machining such woods are still to be worked out. Furthermore, the great diversity of species in the tropical forest makes harvesting difficult where only 100 to 1,000 trees per square mile have commercial value.

As most of the unused forests of the world lie in tropical regions and especially as most of the unused species grow in tropical forests, it is here that the greatest opportunity lies for increasing the contribution of forest to man's welfare. This can be done, of course, only by improving man's understanding of tropical woods and his capacity to use all the trees that grow in the tropical forest, not just the 1 to 5 percent that can find a market today outside of the country in which the trees grow. Tropical woods offer exceptional opportunities for increasing the decorativeness of articles made of wood and for introducing materials of new properties into modern manufacturing.

6. The delegates debated vigorously the merits of clearcutting the original forest and planting pure stands of teak and other species that are in high demand throughout the world. It was brought out that pure cultures invite the hazards of insect and disease outbreaks, and even deterioration in soil. The extent to which the stand composition can be adjusted to man's requirements obviously is a very difficult issue facing the tropical silviculturist.

7. Inadequate transportation facilities exist not only in areas where the timber is remote but even in many well settled sections of the world. One sees along the roads of India, for example, a vast amount of freight being carried on the heads of women and the backs of men, burros, mules, and horses. By comparison a seemingly small amount is being transported by motor vehicles and railways. Modern transportation involves much more than simply the building of roads. It must be accompanied by the organization of trucking companies and other agencies to take responsibility for receiving goods at one place and delivering them safely to another.

8. In addition to transportation is the need for developing trade channels, that is, men engaged in wholesale and retail handling of forest products. This is particularly important if products are to move from one country to another. Trade barriers due to tariffs, quotas, exchange restrictions, and unstable currency all serve to limit the extent to which the forests of the world may contribute to the welfare of man.

9. Research in all phases of forestry needs to be pushed vigorously in every land. This is particularly important in those regions where dry land forestry is important, where timber quality and usefulness is not well understood, and where the natural forest growth contains a great variety of different species.

10. Finally, to realize the most from the world's forests, patterns of international agreements for resource use as a whole will be needed. This calls for international statesmanship of the very highest order. Obviously a long term pledge by one nation to grow timber for export to meet the needs of one or more foreign countries requires a high degree of stability in local governmental policy and an assured market that can give some degree of protection to the nation that so pledges its resources.

The progress in world forestry that has occurred in the last decade is to some extent a reflection of the extremely rapid progress that has occurred in our own country. Many nations hitherto without formal forestry activities have embarked on forestry programs. Study missions have been operative in many Latin American countries, in Afghanistan, Iran, Ethiopia, Thailand, Formosa, India, Pakistan, and many other countries. The prestige of foresters has correspondingly increased together with that of other professional men including agriculturists, engineers, physicians, and scientific men in general. World congresses of professional people are likewise of immense importance in bringing together influential people of many lands, to work towards a common purpose. The mutual understanding, the respect, the friendships, and the devotion to great issues facing mankind as a whole that grow out of these congresses, can be one of the strongest influences towards building international good will and peace. Our own nation can ill afford to slight such opportunities as these international gatherings afford.

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Behavior of South Arkansas Oaks Girdled in Different Seasons

Charles X. Grano

Southern Forest Experiment Station, Forest Service, U. S. Department of Agriculture, New Orleans, Louisiana

Girdling unwanted hardwoods to release pine is a widespread practice in the pine-hardwood areas of the South. This article reports on a 2-year study to determine the season of the year at which girdling is most effective.

GIRDLING is one of the oldest and most widely used methods of eliminating unwanted trees from southern timber stands. The one serious drawback is that a girdled tree of less than about 10 inches in d.b.h. usually sprouts freely.

It has long been suspected that the incidence of sprouting, and also the rapidity of the kill, is related to the time of year at which the girdling is done. An experiment to determine the effect of season of girdling on hardwood mortality and sprouting was undertaken in 1949 on the Crossett Experimental Forest in south Arkansas.

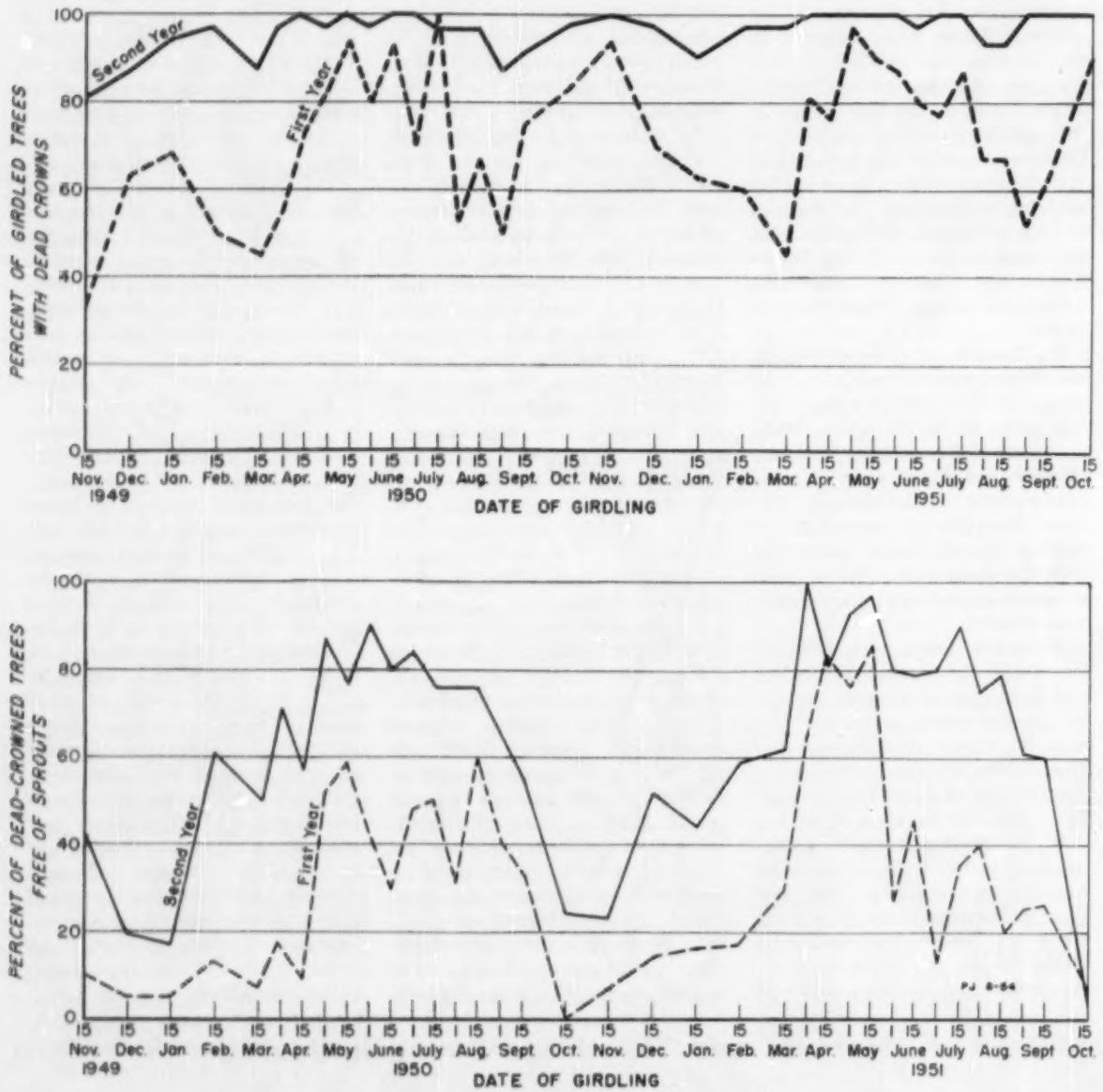

FIG. 1.—Effect of season of girdling on southern red oak.

Methods

The study was established on 108 half acre plots in a shortleaf-loblolly pine-hardwood stand. All unwanted hardwoods were girdled by cutting a notch about 2 inches wide through the bark and cambium, into the wood. The girdles completely encircled the bole. They were made with an ax at easy chopping height, about 3 feet above the ground.

Three plots were girdled on the fifteenth of every month during the dormant season and the least active part of the growing season. This period includes the months of October through March. Three plots were girdled on the first and fifteenth of each month from April through September; this is the most active part of the growing season. The experiment was replicated by repeating all treatments a second year. Girdling was begun on November 15, 1949, and was completed on October 15, 1951.

All hardwoods on the plots were girdled, but only southern red oak (*Quercus falcata* Michx.) and post oak (*Q. stellata* Wangenh.) were numerous enough to permit a sound analysis of results. Data were obtained from hardwoods under 10 inches in d.b.h., as these sizes sprout most readily when girdled. Trees girdled during the active growing season were examined one and two years after treatment. Trees girdled during the dormant season were examined before the leaves fell in the autumn following

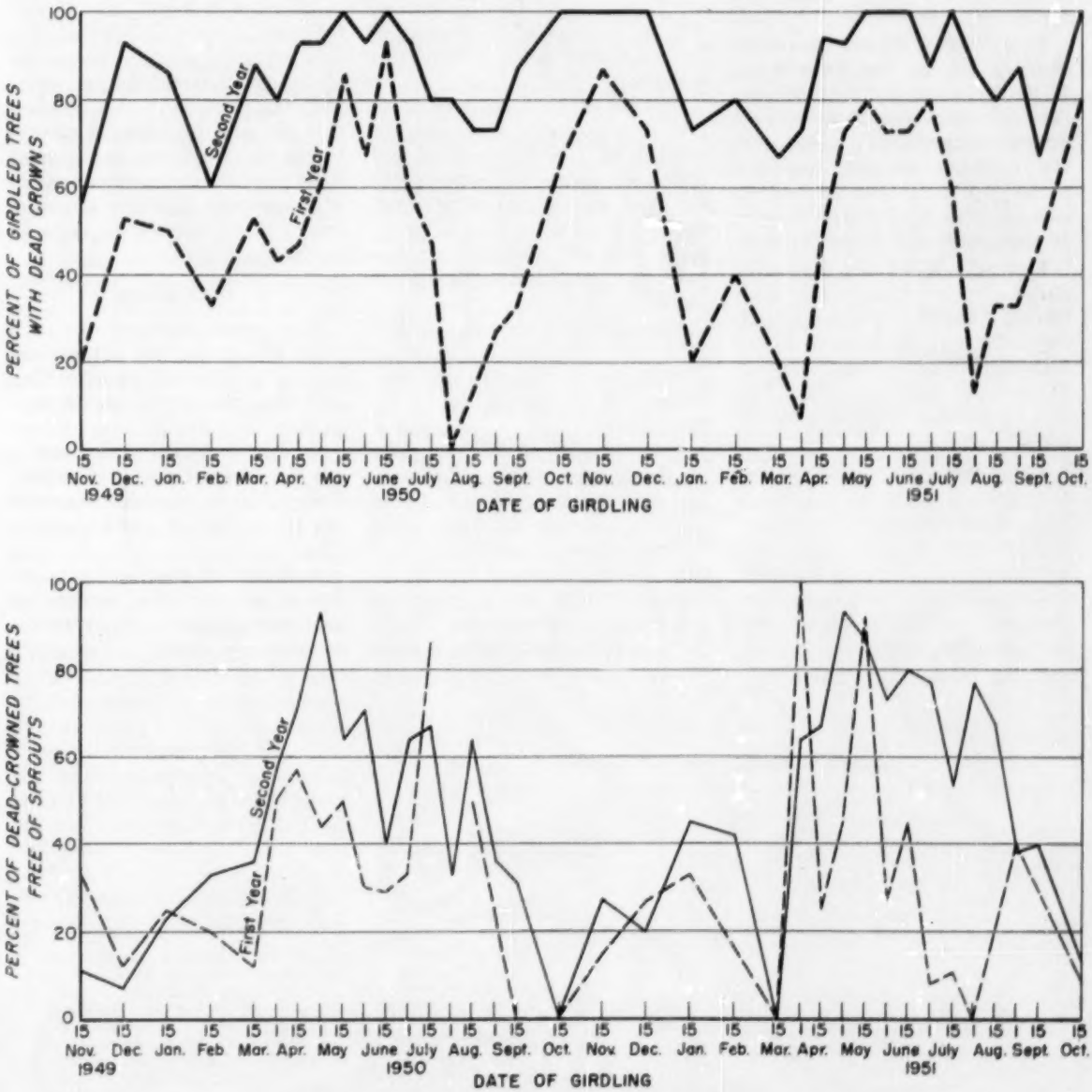

FIG. 2.—Effect of season of girdling on post oak.

treatment and were reexamined a year later.

Mortality

Spring girdling proved best for crown-kill of both red oak and post oak. Figures 1 and 2 show the percent of trees with dead crowns one and two years after treatment. Differences in crown mortality between the 1950 and the 1951 replications were not statistically significant, an indication that variation in weather conditions during the two years did not influence results.

In both years, the best period for girdling red oak was from April 15 through June. For this optimum period, crown mortality a year after girdling averaged 85 percent; the extremes between biweekly girdling periods were 73 and 97 percent. The July 15 and October 15 treatments also showed up well.

Post oak mortality a year after girdling was highest for trees treated from May 1 through mid-July. Girdling done in this period achieved an average mortality of 74 percent, with extremes of 60 and 93 percent between biweekly dates.

Two years after treatment, red oak mortality was so uniformly high (approximately 96 percent) that no effects of date of treatment were apparent. Post oak mortality was much higher than in the first year, but the effect of date of treatment was still evident.

Sprouting

The treatments applied from April 15 through June gave the best control of sprouting on red oak. Month-of-treatment differences in the percent of dead red oak without live sprouts were highly significant. May girdling resulted in the maximum sprout-free proportion of dead trees—an average of 68 percent a year after girdling.

Month-of-treatment differences in the percent of dead post oak without sprouts a year after girdling proved to be significant. May girdling was best for this species, with an average of 58 percent of the dead trees being free of live sprouts.

Because many sprouts died before they were two years old, the number of sprout-free dead red oaks nearly doubled between the first and second year after treatment. The effect of date of treatment was still evident after two years but much less so then after one year.

Many post oak sprouts also died after one year, but the effect of date of girdling was still very pronounced at the end of the second year.

Time of girdling had no effect on the number or size of sprouts per dead sprouting tree. Red oaks averaged 8 sprouts per dead sprouting tree and post oaks 7. For both species, dominant sprouts averaged about 3 feet in height at the end of the second year. Width of the sprout clumps after 2 years was about 3 feet for both red oak and post oak.

Phenological Aspects

Girdling between mid-April and the end of June resulted in a combination of highest mortality and maximum sprout inhibition. At Crossett, this period coincides with the emergence and the attainment of full leaf for both post and red oak. Red oak buds were observed to be opening on March 15. By April 1, red oak leaves were 2 to 3 inches and post oak leaves were 1 to 2 inches in length. By May 1, both species were in full leaf. The most effective girdling period included the interval during which the leaves emerged and attained full size and for about 2 months thereafter. Of course, the calendar dates are different in other sections of the country and vary somewhat from year to year in the same locality.

Conclusions

1. In south Arkansas the most rapid kill of southern red oak and post oak is obtained when girdling is done in the spring, particularly in May.

2. The proportion of dead southern red oaks and post oaks without live sprouts is maximized by girdling in the spring, particularly in May.

3. Season of girdling has no effect on the number of sprouts per dead sprouting tree nor on the size of the sprout clump.

White Pine Weevil Control by Aircraft Spraying[1]

D. P. Connola,[2] T. McIntyre[3] and C. J. Yops[4]

THE white pine weevil, *Pissodes strobi* Peck, is the most destructive insect pest of eastern white pine (*Pinus strobus* L.) in the northeastern United States. Its economic importance was noted as far back as 1817 when eastern white pine was used extensively for ship masts. Attack by the insect results in the death of the leader and destruction of two or three years—sometimes as much as five years—of terminal growth. Young trees, particularly those between 5 and 15 feet high, are most susceptible to attack and suffer the most serious damage. Lateral shoots below the attack become the leaders, thereby producing crooked or forked trees. Repeated attacks may render a tree worthless for commercial purposes.

A study made in 1952 by the Division of Forest Insect Investigations, U. S. Department of Agriculture, in New Hampshire showed that the white pine weevil was responsible for a 40 percent loss in board foot volume of the saw log portions of white pine saw timber (*6*). In spite of the great damage caused by the weevil, many foresters continue to agree that eastern white pine is the most desirable tree for reforestation purposes in the Northeast. Its qualities for construction are unsurpassed by other tree species grown in the region.

For many years foresters have sought methods of controlling the weevil by silvicultural means. These efforts have met with varying degrees of success. Removal of infested terminals and collection of the adult weevils themselves from individual trees have also been tried (*2, 3*). More recently, knapsack sprayer application of lead arsenate to white pine terminals has proven very successful in preventing weevil attack (*1, 4*). However, this method is restricted to small plantings and would be not only expensive but impractical on large acreages.

New York State has thousands of acres planted to white pine on its reforestation areas. Much of the white pine is being attacked by the white pine weevil in varying degrees. The most severe damage occurs in open plantations where survival of the planting stock is poor.

After World War II, experiments in aerial spraying for white pine weevil control were begun. In these studies, which were made in state plantations, DDT and other new insecticides were applied by airplane to control the adult weevils. The work was done in areas having trees 5 to 15 feet tall. Results of this preliminary work indicated that DDT sprays, if applied at the right time and in the right dosage, would greatly reduce adult weevil populations.

It was thought that the helicopter would effect better spray coverage than the fixed-wing plane because of its greater maneuverability and the down draft from its rotor when flying slowly close to the tree tops. Spray experiments were conducted in 1950 and 1951 with a Bell helicopter equipped with a standard boom and B-1 nozzles. It was calibrated to deliver 2 gallons of spray per acre when flying at 18 to 20 miles per hour. The spray was prepared by first dissolving DDT at the rate of 1 pound in 1 quart of Sovacide PD544B and then adding sufficient kerosene to make 1 gallon.

In the 1950 tests, sprays were applied in April to control overwintering adult weevils emerging from hibernation and in September to control the new generation of adult weevils. Much better control was obtained from the April applications than from those made in September (Table 1).

The helicopter tests were repeated in April 1951 but the results, although satisfactory, were not quite so good as the April 1950 tests (Table 1). This may have been due to a difference between the two spray areas. In the 1950 experimental plot 1 (130 acres), the trees were of even height, about 5 feet high, and there were no obstructions in the plantation to interfere with the low flight of the helicopter. In the 1951 experimental plot 3 (540 acres), there were many "stickups" or tall trees in the plantation and along hedge rows which necessitated flying at a higher altitude. Apparently this resulted in a reduction of the down-draft effect from the rotor and produced a poorer deposit of spray. It was concluded, therefore, that since the helicopter must fly higher and faster under such con-

TABLE 1.—HELICOPTER SPRAY TESTS

Experimental area	Date sprayed	Pounds of DDT and gallons of spray	Percent weevilling					
			1949	1950	1951	1952	1953	1954
Plot No. 1 (Chenango 2 N.Y.)	4/27/50	2 lb./2 gal.	25[1]	0.1	14	35		
Check plot	———	———	25	22	29	33		
Plot No. 2 (Tioughnioga N.Y. Game Management Area)	9/15/50	2 lb./2 gal.		29[1]	10	22		
Check plot	———	———		27	26	28		
Plot No. 3 (Broome Chenango 1, N.Y.)	4/26/51	2 lb./2 gal.		30[1]	3	12	29	31
Check plot	———	———		50	46	....	48	40

[1]Percent weevilling prior to treatment.

[1]Published by permission of the director, New York State Museum and Science Service, Journal Series No. 3.

[2]New York State Science Service, New York State Education Dept., Albany.

[3]Northeastern Forest Experiment Station, Forest Service, U. S. Department of Agriculture, Upper Darby, Pa.

[4]Bureau of Forest Pest Control, New York State Conservation Dept., Albany.

TABLE 2.—AIRPLANE SPRAY TESTS

Experimental area	Date sprayed	Pounds of DDT and gallons of spray	Percent weeviling			
			1951	1952	1953	1954
(Chenango 35 N.Y.)						
Plot No. 1	4/24/52	2 lb./4 gal.	50[1]	23	41	38
Plot No. 2	4/24/52 5/ 8/52	2 lb./4 gal. 2 lb./4 gal.	50[1]	2	6	14
Plot No. 4	5/ 8/52 5/26/52	2 lb./4 gal. 2 lb./4 gal.	50[1]	25	25	25
Plot No. 5	5/ 8/52	2 lb./4 gal.	50[1]	31	44	27
Plot No. 6	4/24/52	4 lb./4 gal.	50[1]	2	18	22
Check plot			50	69	66	63

[1]Percent weeviling prior to treatment based on a count made over the experimental area before subdivision into plots.

TABLE 3.—HEIGHT OF RANDOMLY SELECTED TREES IN 1952 AIRPLANE SPRAY PLOTS 2 AND 6 AND IN UNTREATED CHECK PLOT.

Plot No.	Average height of trees		Average post spray growth
	At time of spraying Apr. 24, 1952	2nd year after spraying Aug. 12, 1954	
Plot No. 2	4.6 ft.	11.1 ft.	6.5 ft.
Plot No. 6	5.5 ft.	12.5 ft.	7.0 ft.
Check plot	5.0 ft.	8.7 ft.	3.7 ft.

FIG. 1.—Vigorous straight white pine in DDT airplane sprayed plot. Photograph made in Aug. 1954, showing three seasons of non-weeviled post spray growth beginning where hand is placed on trunk.

ditions, it would have little if any advantage over the fixed-wing plane, which is much cheaper to operate. "Stick-ups" are common in forest plantations and they create a hazard when attempting to apply sprays by aircraft close to the tops of trees.

In 1952, the New York State Science Service in cooperation with the New York State Conservation Department and the Division of Forest Insect Investigations, U. S. Department of Agriculture, designed a program for fixed-wing airplane spray experiments which was carried out that year at Smithville Flats, Chenango County, N. Y. The area was especially suited for experimentation because of the heavy weeviling which occurred over the entire plantation. The trees were planted in 1942 and were 5 to 8 feet high. Because of poor survival of the planting stock, they were widely spaced. Almost all of the trees had been weeviled, many of them two or more times.

The objectives of the 1952 experiments were to compare the spray deposit and the control results of airplane applications with those obtained previously by helicopter.

The experimental area was divided into plots of 20 to 30 acres each and the corners and boundaries of the plots were marked to guide the pilot in spraying. The airplane used was a Stearman biplane owned by the New York Conservation Department. It was equipped with 42 B-5 nozzles on a 30-foot boom attached below the lower wing, and was calibrated to deliver 2 gallons of spray per acre when flying at 80 m.p.h. Therefore, in order to deliver 4 gallons of spray per acre, as planned in these tests, the plane had to cover each plot twice when applying treatments. The sprays were prepared as in the helicopter tests by first dissolving the DDT in Sovacide PD 544B and then diluting it with kerosene to obtain the desired concentration. Dates of application, spray concentrations and results of treatments are given in Table 2.

The best results were obtained in plot 2 and plot 6. These plots were examined in August, 1954 to obtain measurements of the height of trees as compared with the height of trees in the nearby untreated check plot. These data are given in Table 3. Measurements were from 25 trees taken at random from each plot. The trees were distributed over the entire plot in each case. Since almost all of the trees had been weeviled prior to treatment, this condition is represented in the samples.

Discussion of the Results

From the data in Tables 1 and 2 it is apparent that best results were obtained from the early spring treatments. In the 1950 helicopter tests (plot 1), percent weeviling, that is, percent of trees weeviled, was reduced from 25 to 0.1 and in the 1951 tests (plot 3) from 30 to 3. In the 1952 airplane tests, percent weeviling was reduced from 50 to 2 in both plots 2 and 6. These reductions in weeviling represented the control obtained the first season after spraying and all are considered satisfactory. Results obtained with 2 pounds of DDT per acre applied by helicopter were comparable to 4 pounds of DDT per acre applied by airplane. Measurements of spray deposits from the 2 pounds in 2 gallons helicopter treatments were almost identical with those of the 4 pounds in 4 gallons airplane applications (5).

Since the spray is ineffective against the eggs and larvae of the weevil, early spring treatment is necessary to insure deposition of spray before the eggs are laid. The importance of this point in control

is emphasized by comparison of data from the collection and examination of white pine terminals from the plots for egg deposition and larval counts. Egg deposition begins shortly after the adults emerge from hibernation. Therefore treatment should be timed to coincide with emergence.

Tables 1 and 2 show that weeviling in the treated plots was reduced following treatment while levels in the check plots remained high. Additional data collected in the plots showed that weevil populations were also reduced after treatment. The correlations between population and weeviling were most noticeable in plots 2 and 6, of the 1952 tests.

The practical value of airplane spraying for weevil control is demonstrated by a comparison of the height of trees in treated plots 2 and 6 with the height of trees in the nearby untreated plot (Table 3). The reduction in weevil population in the treated plots allowed three seasons of uninterrupted height growth for most trees. The contrast between the treated and untreated plots was very striking. Most of the trees in the treated plots, which were severely weeviled prior to spraying, developed tall straight leaders, some trees growing as much as 9 feet in the three seasons after spraying (Fig. 1). In the untreated check plot, however, most of the trees remained as severely weeviled "cabbage" pines (Fig. 2).

FIG. 2.—"Cabbage" white pine in untreated check plot. Photograph made in Aug. 1954 showing the results of repeated white pine weevil attack.

Conclusions

Results of these experiments indicate that airplane spraying with DDT can be used successfully for control of the white pine weevil. Aerial spraying is the only practical method of treatment for large acreages. Weevil populations were reduced to such a low level that two or more years were required for the population to build up to damaging proportions.

On the basis of field observations, it is estimated that a 6 x 6 white pine plantation with good survival of the original planting stock can withstand 5 to 10 percent annual weeviling and still produce an adequate supply of potential crop trees each yielding a straight 16-foot butt log. On the basis of this estimate, if aircraft spraying consistently produces the degree of control which characterized the tests reported above, it would be expected, if the control is applied when annual weeviling reaches a 5 to 10 percent level, that an adequate selection of final crop trees would be possible. It may be pointed out, however, that treatment may seldom be necessary in areas where weeviling normally remains below the 10 percent level but on occasion temporarily rises above it. Treatment, therefore, is justifiable only in areas where heavy weeviling is expected. On good growing sites in such areas, it may not be necessary to spray more than twice in the life of a plantation to ensure an adequate number of good crop trees per acre. Present cost of each spray treatment is estimated at $2.50 to $4.00 per acre, depending on the size of the area and the operating costs.

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Soil Surveys for Game — Range Development[1]

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MAN'S STRUGGLES against vegetation extend far back beyond history. They have existed on every continent repeatedly. Man has not always won these contests and when he has, it has too often been only to lose again for the soil had been in partnership with the objectionable vegetation and on its removal followed it over the brink.

California has a little over ten million acres of brushland that has been a problem in several aspects. The Mediterranean climate with wet winters and dry summers resulted in the development of some unique vegetation. There were grasslands on the deeper soils at the lower elevations, conifer forests in the cooler and moister mountains and along the humid north coast, but in the rugged terrain between where the rainfall is moderate to light, a zone of broadleaf, but evergreen shrubby vegetation developed. The Spanish gave it its most commonly used name, *chaparral*. It can be called a "fire-type" since it was burned repeatedly since time immemorial and it re-establishes itself quickly by seeds and sprouts following fire. The soils of the zone are usually shallow with little arable land and seldom are they of sufficient depth to support conifer timber.

During the days of the pioneer these brushfields were burned repeatedly for a number of purposes. First, to facilitate prospecting by the gold seeker, then by the stockman to gain access to intermingled feed areas, to facilitate the handling of his livestock and also for the sprouts and herbaceous forage that grew for a few years following the burn. Occasionally strips and patches were burned to afford protection to his improvements from fire and to the cured grass in his pastures as well.

With the full settlement of the state the threat of fire to improvements and to other values often deterred many individuals from such burning. The threat of damage suits by neighbors had a similar effect. Fires rushing up into the timber types pushed back the timber line. Laws were enacted governing the use of fire. Extensive watershed damage brought a realization that there were still other values requiring consideration.

Protection of these lands from fire was established and as the land was reclothed with shrubs and trees, forage values diminished, livestock handling was made more difficult and because of the increase in the amount of fuel, the damage to individual acres from wildfires increased.

There is wide interest in the possibility of managing these lands. Timberland owners, foresters, livestock owners, power companies, irrigationists and municipal water users became interested in their management and, of course, were not all in agreement in what their management should be. Deer were attracted to burns and such an opening of the dense cover facilitated hunting. Deer, rabbits, and quail are important game species over much of the area, diminishing in numbers where the vegetation is too dense for their travel and feeding or where the brush is too tall to have much available forage. Sportsmen became interested.

There is a trite saying in California that "water is king" and there are few that will argue the contrary. There is fair agreement, therefore, that a vegetative cover must be maintained that will preserve watershed values.

The State Division of Forestry has the responsibility for protecting a large part of this zone from fire. In an approach to this problem, it secured an appropriation in 1947 which provided for a soil-vegetation survey that might serve as a guide to the management of these lands by indicating what the various subtypes could or should grow. This supplemented the forest survey started in California by the California Forest and Range Experiment Station of the U. S. Forest Service in 1946.

In cooperation with the University of California, survey methods were developed that would furnish the information needed for the proper development of these wild lands. Vegetation types and soil types were closely allied. The method developed was a combined soil and vegetation survey, however, these features were mapped separately. The vegetation map showed what was growing on the soil. The soil map indicated what should grow upon it and therefore the cover manipulation that could be applied.

From the study of aerial photographs, Timber Stand Maps were prepared for adjoining and intermingled areas of conifer timber. They will not be discussed here. The second series of maps, called Vegetation-Soil Maps, show vegetation and the soil types that are obtained by field survey. The broad vegetation types include commercial conifers, noncommercial conifers, hardwoods, chaparral sagebrush, grass, and various mixtures of these. These were subtyped on the basis of the principle components of the vegetation.

Before the work in soil mapping started, it was necessary to determine the important soil characteristics requiring consideration in this type of program. This resulted in soil classifications that would indicate potentialities for timber, grass and water production. The system had to be useable by field men whose primary training had been in forestry rather than in soil science. The standard classification of soil series was found to be the best mapping unit for wildland soil.

Depth of soil is highly significant for wildland management. The mapping program, therefore, delineated for each vegetation unit,

[1]Delivered before the 20th. North American Wildlife Conference Montreal, Quebec, March 1955.

(1) the prominent soils series and (2) average depth.

The soil series characteristics relating to hydrology and watershed management such as the capacity of the soil to store water, its permeability, erodability, etc., were also explored.

Following the development of this methodology, an area of about two million acres, the greater part of Mendocino County was surveyed. This is one of the real problem areas. Most of the area was privately owned land, but the resulting work and the maps served as an excellent guide to the owners in developing a land management program. It prevented them from spending money on soils where there was little chance of obtaining the objective they sought. Instead, directed them to areas where there was the best opportunity for success in cover manipulation. For the stockman it delineated the potential grasslands; for the forester, it delineated the potential timber lands. It aided by justifying certain water conservation programs and within the timber types permitted the forester to develop effective guidelines for the prevention of erosion on roads and skidways in logging operations.

The role of wildlife and much of the effect of cover manipulation upon it was yet to be studied. Game had a very important place in this zone of vegetation and the foresters and game technicians soon got together to face the problem. This resulted when the mapping program was extended into the Mendocino National Forest and an additional area of 250,000 acres was programmed. This was an important big game area and had heavy hunting pressure since it was open to public shooting. The State Department of Fish and Game assigned a wildlife technician to the project whose duties were to determine the game populations, seasons of use of different areas by deer and preferred forage species.

This game survey showed that there was usually a year-round population of deer within the brush type supplemented by a wintering herd that migrated down from the higher elevations because of snow. The survey also showed large areas almost devoid of game because of the density of the cover and concomitant habitat deficiencies. Quail were absent from areas of continuous shrub cover. The old-growth chaparral was of low value, much of it out of reach of deer and low in rabbit population except where it joined more open areas with herbaceous vegetation. Numerous burns resulting from accidental fires within the zone indicated that burned areas were eagerly sought by game. Contemporary work on Pittman-Robertson Projects showed that game populations could be increased markedly by opening up brush areas by spot burning or by use of farming equipment.

An action program was prepared for a test area of 15,000 acres which would open up and develop the area to the limit of our present knowledge.

This plan included opening up the brush fields with tractor trails for access by both big game animals and by hunters, also breaking up brush fields with tractors to secure an interspersion of low sprouting brush as a new food supply, with high brush for game cover adjoining it. It was also planned to convert some of the brush area to open types of low shrubs and herbaceous vegetation which gave a combination of forage types and made green grass available during most of the winter.

In removing cover temporarily on this rather rugged terrain, it was necessary to give considerable consideration to the effect on the watershed. Naturally the good soils were on the gentle slopes where there was greatest opportunity to control soil movement. The erodability of each soil type was considered and treatment methods restricted to certain slopes in each. Often the work was conducted in the manner of contour farming. Reseeding with grasses and forbs was conducted on all areas where brush was removed.

For plowing, a heavy tractor was used with a brushland plow, a piece of equipment that had been developed especially for working brushy and rocky areas on the western ranges. In heavier brush the bulldozer was used. This was quite effective since the stems of most chaparral species are stiff and heavy and give way to the bulldozer blade when it is set to a shaving position about four inches above the ground. The plant material was windrowed by the bulldozer and subsequently burned. Where it was desirable to reseed with perennial grasses, the ground was thoroughly prepared by discing. Spot-burning was applied to some gentle slopes near ridge tops, making burns from one to five acres and giving an interspersion of open and dense cover. With the burns kept small, watershed values were maintained.

Burning during the fire season is very hazardous, but a series of techniques have been developed to perform the task safely. Following burning, many of the brush species re-sprout immediately and much of the seed stored in the soil germinates. It has a tendency to develop a denser stand of brush than existed at the time of burning. The arable lands within a burn may be reseeded to perennials. In some cases the seeds of annual grasses (which are available at low cost) are scattered in the ashes and these germinate with the first rain. These grass plantings are usually quite successful and offer sufficient competition to newly germinating brush seeds that few survive. Many sprouting brush species are highly resistant to chemical sprays with the result that we have a problem of regrowth of brush. This is not yet solved but undoubtedly will be overcome within a few years since the problem is being attacked by several agencies.

An action program is developed entirely in the field. The forest ranger and a representative of the Department of Fish and Game go into the field equipped with the soils-vegetation maps, getting on to a series of points where a view of the country can be secured. They map areas suitable for development from the soils map. Ocular inspection gives indication as to the limitations caused by excessive slopes.

By use of the aerial photos, the plan may be developed in still more detail since the soils-vegetation map rarely includes units of less than forty acres. The use of the aerial photos also permits the extension of the plan to small areas not conveniently visible. The final step is to map proposed tractor trails which will provide access for deer and also for hunters.

The action program for the area was financed for the most part by the Department of Fish and Game. It contracted for the tractor and operator on the basis of a daily rate. A Forest Service disc and drill was used and the Forest Service financed a part of the reseeding. Concurrently the California Forest and Range Experiment Station of the Forest Service conducted reseeding trials and cultural methods in similar types and within the area being treated. The tractor work was done under the supervision of a Forest Service or Fish and Game representative who furnished more or less continuous guidance to operator. As the various areas were opened up, facilitating access, minor revisions of the plan were made in accordance with the conditions found.

It is, of course, difficult to evaluate the results of any habitat development program. In the first place, knowledge has not reached the point where we can apply a value to hunting and fishing. Secondly, with so many variable factors, it is not possible to measure the effect of a habitat improvement program on game populations without accurate records over a long period of years. This much we do know, forage for deer has increased markedly and the deer, as usual, have responded. Hunting pressure has increased and in spite of this hunter success has improved. Previously, hunting was most difficult and one might say the herd was practically un-shot. Quail numbers have increased where grassy openings have been created, and cottontail rabbits have responded in a great way where there were good soils supporting some succulent vegetation. Rabbits reached a high peak in population in just a few years and apparently are adopting a cyclic population pattern typical of the species in this state.

The costs have been high for each acre treated, yet these treated areas are but a part of the whole new habitat and it is necessary, therefore, to assess a good portion of the costs to the untreated areas. It is, of course, impossible to develop an accurate cost-benefit ratio. Within the 15,000 acres, less than 1,000 were actually treated. This was at a cost of over $25.00 per acre. If assessed evenly to the entire area would give a cost of $1.50 per acre. However, this still is a poor figure since the work has been on a trial and error basis—developing methods as we went, making mistakes and doing some useless work. But actually a useable pattern has been developed. Unit costs can be markedly reduced and the development of new equipment and new herbicides will effect further economies. Neither the Department of Fish and Game nor the Forest Service is ready to argue that a favorable cost-benefit ratio will result in very many areas. On the other hand, the sportsmen and the rest of our people will be insisting that all land be put to its highest use. Much of the ten million acres of chaparral lands in the State of California are valuable chiefly for the production of water and wildlife. The major opportunity for increasing the supply of wildlife is by making the land produce it. We feel, therefore, that monies will be made available for the continuance of the program.

Conclusions

1. On agricultural lands the existing vegetation is important only as an aid in soil mapping. On wild lands vegetation type maps are essential to a soil mapping program since the vegetative cover is the crop with which the owner or land manager must deal.

2. This paper does not propose that game management agencies proceed to finance soil surveys. Instead it recommends that where there have been soil surveys in good game territory, the responsible game management or land management agency explore the information they furnish and determine if it would assist in directing land management programs towards improving wildlife habitats.

3. Where there are soil surveys in progress in good game territory it may be desirable to assign a wildlife technician to the survey. He would not only collect basic information on wildlife but also learn the local soils and the potentialities for cover manipulation as well as wildlife production.

4. With a knowledge of the local soils it is possible to develop sound action programs for the manipulation of vegetation types either by direct methods, using farming machinery, fire, etc., or indirectly, by adjusting silvicultural practices.

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Some Treatment Effects on Loblolly and Shortleaf Pine Reproduction

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THE ESTABLISHMENT OF loblolly and shortleaf pine reproduction following various silvicultural treatments has been studied repeatedly and, as to be expected of any species whose normal range spreads over a wide area, the studies have resulted in varying interpretations, dependent upon region, site, type, silvicultural treatment, and time. There is undoubtedly a strong interplay between the various factors which does not permit the derivation of simple, general rules. In order to get some insight of the effects of several systems of silvicultural treatment for a specific area covering a period of years, the Crossett Lumber Company in southeastern Arkansas started a series of tests in 1946. Each year for five successive years, an 80-acre block of merchantable second-growth pine with fairly uniform distribution of volume and canopy was selected for treatment. Each block was divided into five plots. Five even-aged, harvest-cutting systems were assigned to the plots as follows:

1. Clearcutting on a 5 by 20-chain strip, running in an east-west direction, bounded on its long sides by 5-chain isolation strips; designated as CC in the following discussion.
2. Four pine seed trees per acre on 20 acres (ST-4).
3. Eight pine seed trees per acre on 20 acres (ST-8).
4. Pine shelterwood of 25 square feet basal area on 10 acres (Sh-25).
5. Pine shelterwood of 40 square feet on 10 acres (Sh-40).

Untreated check areas were not defined directly, except as appearing in the clearcutting isolation strips and in the stand surrounding the block. Each plot in turn was divided into two subplots, one of which was broadcast burned following cutting and the other left unburned. Figure 1 shows a typical layout. Uncut strips of five chains width were left on each long side of the clearcut area and an isolation strip 2.93 chains wide established just inside the edges of the forty acres treated by the seed tree methods. Thus a net area of five acres is included in each cutting and burning treatment.

This report deals solely with the germination and establishment of pine reproduction as it occurred on the first two blocks of the series. A final assessment of any particular treatment method must, of course, include also an analysis of the behavior of the residual stand; hence this report supplies only a partial answer. Each year through 1953, seedling counts were made by the students attending the Yale Forestry Camp at Crossett, Arkansas, in late March or early April after spring germination was fairly complete. Camp routine as well as the development of herbage and undergrowth did not permit waiting until the last seed had germinated. The series terminated in 1953, since in that year a fire swept one block and ruined it for further comparative purposes.

Before the first count was made, iron pipes were set at a systematic spacing through each of the ten subplots, as indicated in Figure 1 for two of the treatments. Each pipe was the center of a circular plot 7.447 feet in radius, thus covering four milacres, but split on cardinal directions into four milacre quadrants for the purpose of simplifying seedling count. In this manner, counts of 48 milacres were obtained for each treatment combination with one exception, namely in the first block where the clearcut subplots had 16 circular plots or 64 milacres of tally.

Details of Block Establishment

The first block, hereinafter called Block I, was cut for pine saw logs as marked to produce the required residual stand and for all hardwood logs in September 1946. The subplots assigned for burning were burned on October 15, just after the pulpwood from tops and marked submerchantable trees and chemical wood from sound hardwoods was removed. On unburned subplots such wood was removed in November. All remaining hardwoods were girdled down to 5½ inches d.b.h.

Block II, located about 12 miles to the east and north of Block I, was cut for saw logs in August and September 1947. Pulpwood and chemical wood were removed by late September and burning done by mid-October. Again all remaining hardwoods down 5½ inches were later girdled. On this block, the burn in the seed-tree area

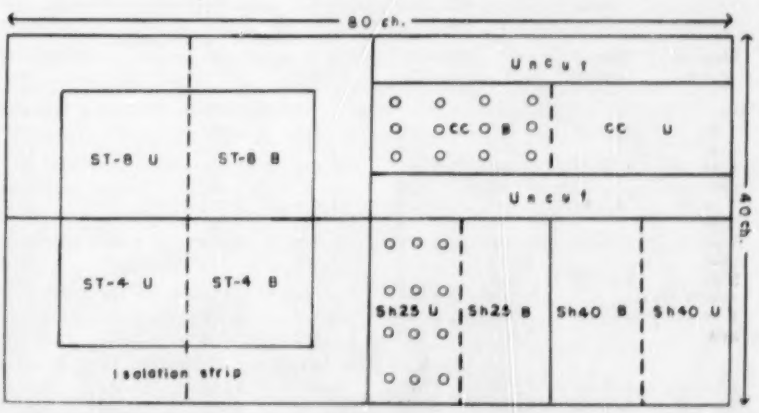

FIG. 1.—Layout of experimental blocks with treatments.

Symbols

CC—clearcut; ST-4—four pine seed trees per acre; ST-8—eight pine seed trees per acre; Sh-25—pine shelterwood of 25 square feet basal area per acre; Sh-40 pine shelterwood of 40 square feet basal area per acre; B—burned; U—unburned.

escaped slightly into two subplots assigned for no burning, with the result that a few of the reproduction plots in these subplots had to be switched to the burned category.

Since the peak of seedfall in this area occurs usually in late October, both cutting and burning dates preceded the time of maximum fall. It appeared possible that some of the seed in felled tops, had they not been consumed by the slash burn, could have contributed to the new seedling stand, but later comparisons between burned and unburned subplots did not bear out this possibility. The seedling counts confirm the impression that regeneration depends almost entirely on the seed crops of the residual trees or of trees in the surrounding banks of timber. On both blocks, advance reproduction was very sparse, owing to the original complete crown closure.

Seed Crops and Years

The establishment and behavior of reproduction depends strongly on the nature of the seed crop, particularly in the year the stand treatment occurs. The seed crop in the Crossett area, maturing in 1946 and thus available for germination in the spring of 1947, was estimated as fair. That of 1947 was excellent, one of the best since the bumper crop of 1939. In both 1948 and 1949, the seed crops were failures, followed in 1950 by another fair crop, in 1951 by a very good crop, and in 1952 by a fair crop. The 1952 crop started out to be excellent, but a heavy toll was taken by severe summer drought.

Up through the summer of 1951, the climatic conditions for germination and survival through the summer were normal, that is to say favorable, but starting with the summer of 1952 a series of three years had prolonged and severe summer droughts which exercised a decidedly unfavorable influence on seedling establishment in the entire Crossett area.

An interesting side-light on seed production and viability comes from germination tests made on seed collected from residual trees in Block II, where the slash burn had scorched and killed some trees. For trees killed by the fire, a germination percentage of only 16 percent was scored. For trees whose crown was half scorched, the seed from the lower scorched half scored 21 percent and that from the upper unscorched half 50 percent. For unscorched, green trees, germination was 70 percent.

Overall Seedling Counts

In the following discussion four categories of seedling measurement will be investigated: (1) actual seedling count; (2) seedling distribution as evidenced by stocked quadrats; (3) relationship of number of seedlings per acre to degree of stocking; and (4) height of the best seedling per quadrat. No attempt was made to distinguish between loblolly and shortleaf, since they are difficult to separate in early seedling stages.

Table 1 lists the annual seedling counts, adjusted to the acre basis, for the five cutting operations and the two burning treatments. Two seedling ages are recognized, namely the newly germinated seedlings and those one or more years old, with one exception as can be noted in the table. Advance reproduction does not enter into the count. The counts cannot be accepted strictly at their face value for two reasons —late germination will increase the numbers of the newly established crop and some seedlings may have been missed. The count therefore has a bias to the low side; it never gives on overestimate.

The two blocks show radically different seedling histories. Even though the seed crop was fair, Block I got off to a slow start. Initial germination was poor. Shortly after the opening up of the stand, the area was heavily invaded by cattle and substantial portions of the ground were compacted and made less fit for future reproduction to say nothing of the browsing effects by the cattle. In open-range country, such as in southern Arkansas, any heavy opening-up of a continuous forest canopy is a great attraction for livestock. If the

TABLE 1.—PINE SEEDLING COUNT PER ACRE FOLLOWING VARIOUS CUTTING AND BURNING PRACTICES

Class of stock	Date of count	Method of treatment: CC B	CC U	ST-4 B	ST-4 U	ST-8 B	ST-8 U	Sh-25 B	Sh-25 U	Sh-40 B	Sh-40 U
Block I. Cut September, 1946, in a fair seed year											
1 yr.	4-20-48	312	207	125	333	437	83	458	333	1,292	625
new		1,656	266	2,583	833	3,500	146	3,729	4,458	7,417	2,125
1 yr. +	4-19-49	796	1,187	2,229	1,792	3,437	395	4,625	3,042	9,270	3,479
new		62	0	62	42	21	0	83	0	42	0
1 yr. +	4-7-50	719	1,391	1,979	1,750	2,916	417	3,542	2,604	6,542	2,520
new		0	0	125	21	42	0	0	21	0	0
1 yr. +	3-29-51	672	1,078	1,833	2,200	2,250	396	2,837	1,729	5,771	2,250
new		2,109	672	6,271	854	4,583	1,021	2,646	3,625	3,875	1,396
2 yr. +	3-28-52	656	1,078	1,812	1,896	2,299	396	2,937	1,562	5,437	2,021
new & 1 yr.		5,781	1,109	9,812	2,396	7,500	1,271	4,562	5,562	4,458	2,000
1 yr. +	4- 2-53	906	2,750	2,542	2,521	2,937	750	3,604	2,896	6,568	4,021
new		1,953	281	458	208	1,125	62	9,000	708	1,250	1,750
Block II. Cut August and September, 1947, in excellent seed year											
1 yr.	4-20-49	7,479	3,812	21,931	6,167	16,577	4,473	26,167	10,306	13,229	3,062
1 yr. +	4-10-50	7,413	3,895	20,334	4,000	14,769	4,418	22,000	9,333	11,521	1,729
1 yr. +	3-30-51	6,958	3,375	17,750	4,000	13,865	4,800	21,900	9,361	8,333	1,187
new		583	146	0	0	346	2,564	3,667	2,528	4,167	1,979
2 yr. +	4- 4-52	6,542	3,375	17,181	4,000	13,423	4,582	19,850	7,919	7,729	875
new & 1 yr.		1,417	458	139	167	1,019	2,182	2,000	1,722	13,791	8,667
1 yr +	4- 8-53	6,354	3,729	14,750	3,458	13,423	4,091	17,750	7,438	8,937	1,646
new		583	208	0	0	0	45	433	83	4,312	3,229

seedling catch is not quick, the area will be made partially unfit for later regeneration owing to the above-noted compaction and browsing plus increasing competition from grass, herbs, and brush. New regeneration is, however, not completely inhibited. The excellent seed crop of 1947 increased the number of seedlings one year old and older three to twenty-fold by 1949, though the number did not by any means reach the level attained in Block II where the catch was immediate. With the two subsequent poor seed crops the counts tapered off, but again increased with the better crops of 1951 and 1952. It is clear that new reproduction in later years will not contribute as successfully to permanent stocking as if the catch were obtained immediately after treatment. Although the block at the last count averaged 2,880 seedlings per acre, it gives the visual impression of being decidedly understocked.

Block II, established in a year of excellent seed crop shows little similarity to Block I. Here the catch was immediate and maximum numbers were established the first year. Cattle invasion again occurred, but being simultaneous with seedling germination did not have the lasting effect as on the first block. Regeneration in later years was not precluded, in spite of the overabundance of the initial crop, but on the whole was less abundant than in Block I and with little if any effect on the permanent stand. The numbers decreased steadily through the years. The reproduction stand here soon assumed a "dog-hair" characteristic, although within the period of remeasurements the effect of overdensity on seedling development was not detectable. Through this initial phase, the seedlings on Block II fared as well as, if not better than, those on Block I, except for the inevitable heavy mortality through competition. On Block II, the original count in 1949 averaged 12,538 seedlings per acre and the last count in 1953, prior to the destruction of the block by fire, 9,071 seedlings one or more years old.

The comparison of the two blocks, as far as seedling counts are concerned, leads to the following points:

1. The immediacy of catch has a profound effect of subsequent regeneration history.
2. With low initial germination, additions to the permanent stand are made in each good seed year, but the contributions are not of the same order as if the catch were immediate.
3. The total number of seedlings developing and surviving in an area where initial catch was poor does not promise to reach the full number where catch was good and immediate, even over the course of six years.
4. Even in years of a fair seed crop, the catch is not complete as may be desired. In years of excellent seed crop, on the other hand, the catch may be too heavy.

Seedling Count as Related to Treatment

Table 1 can be used to draw certain inferences and conclusions regarding the relationship between seedling count and silvicultural treatment. On Block I, the number of seedlings increased with the quantity of the residual stand, this general relationship holding true for the life of the test. Although all five cutting treatments got off to approximately the same start, the heavy residual stands in later years built up the counts more effectively. Clearcutting was decidely the inferior method over the run of years.

Burning was effective in increasing seedling numbers only in the heavier stands from eight seed trees per acre and up. For the clearcut plot, the reverse was true, owing probably to the more rapid development of sod and low brush competition plus the more severe cattle invasion. A favorable burning effect carries on through the years, since with few exceptions, more seedlings germinated on burned subplots than on unburned, though doomed to pass out of the picture in large numbers.

In Block II, clearcutting again proved to be inferior as far as seedling count is concerned initially and through the years. Here there was little relationship between seedling count and heaviness of the residual stand. Wherever any trees were left, the counts were more than sufficient to produce a full stand. A marked superiority of burned over unburned subplots appeared throughout. Again, as with Block I, the burning effect lasts over the years as far as new germination is concerned, but again the benefit is largely transitory, even more so than in Block I.

Statistical support for the above general observations is obtained through the use of analysis of variance of the year and treatment effects on the logarithms of the numbers of seedlings one or more years old. Student's t-test is then applied to establish significance between the various treatment levels. For Block I, high significance ($P < .01$) is attached to years and method of cutting and significance ($.05 > P > .01$) to burning and the interaction between method of cutting and burning. On Block II, all main effects plus the interaction between method of cutting and burning show very high significance with the interaction between years and burning showing significance.

On Block I, the overall numbers of seedlings increased substantially in the second year of the record and again in the final year, while in Block II, there was a steady decrease, tapering off in significance with the years.

Though burning on Block II was highly favorable in all cases, on Block I the results were more erratic. Here nonburning was significantly better than burning in the clearcut plot, while the reverse was true on the eight-seed-tree plot (ST-8) and the two shelterwood areas (Sh-25 and Sh-40).

Use of the t-test shows clearcutting to be quite inferior to all other methods of cut with one exception, namely on Block I where the eight-seed-tree plot (ST-8) was significantly poorer for no logical reason. Outside of this exception, on Block I there was a progressive-

ly better count with increasing heaviness of the reserve. On Block II, the same rule holds up to the heavy shelterwood plot, where the count suddenly decreased to a highly significant degree.

The following general conclusions can be drawn from the above discussion:

1. The clearcut system is decidedly inferior to the other systems, regardless of the success of the initial catch.

2. With low initial catch, further improvement can be expected in good seed years, the increase being dependent upon the heaviness of the reserve.

3. With good initial catch, the numbers depend strongly on the heaviness of the reserve until the overhead canopy becomes too dense, but actually there is little to choose between any of the methods which leave reserve trees, owing to the large seedling counts.

4. Burning treatment is usually highly effective, particularly where the catch is immediate and, in the event that the initial catch is poor, where the overstory is heavy.

5. Burning has a lasting effect over the years as far as promoting new reproduction is concerned, but this advantage after the second year is largely ephemeral, except where the initial numbers are low.

Stocking

Total number of seedlings does not necessarily convey a good impression of the adequacy of stocking as far as the evenness of seedling distribution is concerned. This is estimated better by means of stocking percentages based on the stocked quadrat system. A quadrat is considered stocked so long as it has one established seedling on it. Seedlings in excess of one required to not contribute further to the stocking measure. The stocking percentage is obtained by dividing the number of quadrats on which at least one seedling has been observed by the total number of quadrats. Full stocking, using milacre quadrats, would indicate 1,000 seedlings per acre, spaced at approximately 6.6-foot intervals throughout. Table 2 lists these stocking percentages. Here the first value pertains to the seedlings one or more years old and hence "established," the second to all seedlings regardless of age.

On Block I, the initial stocking percentages of 1-year stock were prevailingly low, but new germination raised the levels substantially by 1949. For combined treatments, the situation then seems to stabilize for the following two years, succeeded by a good gain in 1952. Ultimate stocking is poorest on the clearcut plot and appears to build up with additions of the reserve stand, reaching best development under the heaviest reserve. Burning in general appears to have a beneficial effect particularly in the case of the heavier reserve stands, but with clearcut plots being the exception.

TABLE 2.—PERCENTAGE OF STOCKING BY THE STOCKED QUADRAT METHOD.

Class of stock	Year of count	CC		ST-4		ST-8		Sh-25		Sh-40	
		B	U	B	U	B	U	B	U	B	U
Block I											
1 yr.	'48	20	16	8	19	25	6	15	19	48	42
All		69	23	81	31	73	23	92	81	85	81
1 yr. +	'49	42	47	67	54	79	31	83	75	94	90
1 yr. +	'50	38	55	62	56	73	33	83	69	88	77
1 yr. +	'51	38	53	60	71	69	27	77	69	90	79
All		67	62	92	88	92	65	90	88	98	92
1 yr. +	'52	67	61	90	77	85	52	88	88	98	79
All		92	75	100	77	92	58	94	94	100	79
1 yr. +	'53	47	75	69	71	73	42	81	90	94	83
All		69	75	85	85	83	44	94	92	98	88
Block II											
1 yr.	'49	100	69	100	71	100	75	100	83	96	60
1 yr. +	'50	100	65	100	61	100	73	100	89	94	48
1 yr. +	'51	100	65	100	79	100	73	100	89	92	35
All		100	69	100	79	100	89	100	92	92	79
1 yr. +	'52	100	67	100	79	100	84	100	92	92	33
All		100	73	100	79	100	84	100	92	100	88
1 yr. +	'53	100	60	100	75	100	90	92	88	92	42
All		100	69	100	75	100	90	92	88	100	85

On Block II, complete stocking was obtained immediately on practically all burned subplots. Unburned subplots lagged behind with very little build-up, if any, through the following years.

Statistical support for these general observations is found in an analysis of the angular transformations of the percentages and by use of the *t*-test for treatment differences. On Block I, the factors of years, cutting method, burning, and the interaction between cutting method and burning were all highly significant. On Block II, the burned subplots were rejected from the calculation of analysis of variance owing to the very high proportion of values of 100 percent. In this case only cutting method showed high significance, although it is obvious that burning would also be of this rank.

The application of *t*-tests on Block I, shows clearcutting to be inferior to the other methods with the exception of ST-8, with the latter tending to be inferior to all other methods, again for some unaccountable reason, other than that behavior on the whole is more erratic in years of poor initial catch than when catch is good. On Block II (unburned subplots only) Sh-40 was distinctly poorer than any other cutting method, including even clearcutting. Clearcutting was poorer than ST-8 and Sh-25 and ST-4 and ST-8 poorer than Sh-25.

Over the successive years, Block I showed substantial improvement in 1949 and again in 1952 with a significant decrease in 1953, following a drought summer. For Block II, there were no established differences from year to year.

In regard to the interaction between method of cutting and burning, ST-8 and Sh-40 showed highly significant improvement in the favor of burning, but clearcutting was significantly on the opposite side.

General conclusions based on the above general observations and statistical inferences are:

1. For areas cut in years of poor initial catch, the distribution of seedlings as expressed by stocking

percentage is poor, but tends to improve over the years, dependent upon the heaviness of the residual stand and the fullness of the seedfall.

2. For areas cut in years of good catch, distribution is practically perfect on all burned subplots, but not on unburned subplots.

3. With heavy overstory, where initial catch is light, comparatively full stocking appears possible over the course of the years, but on the whole, the unburned subplots will lag behind the burned areas.

4. When initial catch is poor, stocking percentages increase with the volume in the reserve stand with the exception of the clearcut area. When the catch is good, there is no choice between the harvesting methods.

Relationships of Number of Seedlings Per Acre to Stocking Percentage

Since under the stocked-quadrat system only one seedling is necessary to qualify a quadrat as stocked, uncertainty exists as to the total number of seedlings on hand at any given stocking level. Past investigators have found that the number of seedlings per stocked quadrat increases with degree of general stocking and have arrived at equations to cover the over-all relationship. Examination and use of the data of Tables 1 and 2 indicate that a single average relationship is not valid. The following equations have been developed from the materials here available.

Block I. Logarithm of no. of seedlings per acre = 2.20965 + .01703 stocking percentage

Block II. Logarithm of no. of seedlings per acre = 2.43880 + .01703 stocking percentage

where stocking percentage is carried as a full value and not as a decimal. The exact agreement of the regression coefficient is pure happenstance. Under Block I conditions, a stocking of 40 percent would indicate 800 available seedlings per acre, while with Block II, the number would be close to 1,400.

One concludes from these observations that:

1. Initial energy of establishment strongly affects the level of the relationship between number of seedlings per acre and stocking percentage at given levels of stocking percentage.

2. Initial energy of establishment does not affect the slope of the relationship.

3. Considerable doubt is thrown on the thesis that a single regression can be used for all areas without consideration to initial catch.

Effect of Distance from Seed Source

The systematic location of seedling plots in the long and narrow clearcut areas permit an assessment of the effect of distance from seed source. Had the seed been dropped prior to or during logging and left unburned, one would expect a uniform distribution. On the other hand if the seed came from the bordering uncut strips, a change in seedling count and stocking percentage can be expected from one side of the plot to the other, oriented along the line of the wind prevailing during seed fall.

Table 3 gives the seedling counts and the number of stocked quadrats for each successive line of seedling plots parallel to the uncut north edge of the clearcut plots. Analysis of variance for Block I attributes high significance to the factors of years, burning, and distance from the edge. Of these we are interested only in the last at this point. The significance holds for both number of seedlings and for stocked quadrats. The northernmost line, one chain from the timber edge, is much superior to the other lines and the second line tends to be better than the third. The southernmost line, one chain from the timber bank shows a slight tendency to increase, though not markedly so.

In Block II, the same relationships hold for seedling count, but not for stocked quadrats.

It can be concluded that:

1. Proximity to the north bank of seed supply increases the number of seedlings, even in such a narrow strip at 5 chains.

2. The numbers drop off after the one-chain distance, which in the case of poor seed years is sharp.

3. Later seed years tend to fill in the gaps and to make the whole area more uniform.

4. These effects are more clearly established when initial catch is light and on burned areas.

Average Height of Tallest Tree

Seedling counts and stocking percentages indicate little choice among the various cutting methods, excluding clearcutting. They are all comparatively good and the variation from one block to the other does not permit the selection of any one "best" method. Per-

TABLE 3.—RELATION OF SEEDLING COUNT AND STOCKING PERCENTAGE TO PROXIMITY FROM THE UNCUT EDGES IN THE CLEARCUT PLOTS

	Clearcut-Burned						Clearcut-Unburned					
	'48	'49	'50	'51	'52	'53	'48	'49	'50	'51	'52	'53
A. SEEDLING COUNT ON 16 QUADRATS (ALL AGES)												
Block I												
North line	74	26	21	55	157	81	19	44	44	50	65	84
Line 2	18	12	9	55	133	26	8	13	18	25	25	45
Line 3	12	4	6	42	58	19	4	13	16	23	31	34
South line	20	13	10	26	64	63[1]	5	10	11	14	19	31
Block II												
North line		166	158	151	150	128		56	62	66	70	81
Line 2		114	118	112	126	118		60	59	47	50	42
South line		79	75	80	96	87		66	65	56	62	66
B. NUMBER OF STOCKED QUADRATS												
Block I												
North line	16	13	10	15	15	16	9	10	12	12	14	15
Line 2	11	5	5	10	16	9	2	7	9	13	13	14
Line 3	4	1	3	9	13	9	2	6	6	11	11	10
South line	12	8	6	9	15	11	3	7	8	10	10	9
Block II												
North line		16	16	16	16	16		9	7	9	9	10
Line 2		16	16	16	16	16		12	12	12	12	15
South line		16	16	16	16	16		12	12	12	12	(8)

[1] '40 in one clump.

TABLE 4.—TALLEST TREE PER QUADRAT. AVERAGE, MAXIMUM, AND PERCENTAGE SUPPRESSED. 1952.

	All dates of origin				Excluding '51 and '52 origin	
Method of cut	No.	Maximum height, feet	Average height, feet	Percent suppressed	No.	Average height, feet	Percent suppressed
Block I							
Clearcut							
Burned	59	16	3.20	61	26	6.96	12
Unburned	47	11	2.74	49	32	3.91	25
4 seed trees							
Burned	48	10	2.61	40	26	4.61	19
Unburned	29	13	5.79	41	26	6.42	35
8 seed trees							
Burned	44	12	3.20	48	33	4.18	30
Unburned	21	12	3.05	52	13	4.77	31
25 ft² shelterwood							
Burned	45	12	3.98	49	36	4.91	36
Unburned	42	10	3.26	69	35	4.09	61
40 ft² shelterwood							
Burned	(data missing)						
Unburned	41	6	1.80	49	29	2.45	28
Average							
Burned	196		3.24	50	121	5.09	26
Unburned	186		3.18	53	133	4.21	37
Grand average			3.21	52		4.63	32
Block II							
Clearcut							
Burned	48	10	5.44	21			
Unburned	35	8	4.71	43			
4 seed trees							
Burned	48	11	5.83	4			
Unburned	42	11	4.69	19			
8 seed trees							
Burned	48	10	6.33	6			
Unburned	41	9	4.76	42			
25 ft² shelterwood							
Burned	48	9	3.90	31			
Unburned	45	12	4.29	42			
40 ft² shelterwood							
Burned	46	6	1.58	76			
Unburned	15	6	2.00	67			
Average							
Burned	238		4.64	27			
Unburned	178		4.36	39			
Grand average			4.52	32			

haps another measure such as the height of the best seedling on the quadrat may help in arriving at a decision. Such a tally was made in 1952, the results appearing in Table 4. The only general conclusion that can be drawn from this table is that for the duration of this experiment the 40-square-feet shelterwood handicaps seedling development. Block I, though established a year earlier than Block II, tends to lag behind the latter since the seedlings tend to arise from delayed germination. Little difference can be noted between the average heights on the burned and unburned areas, though there is a slight indication that the heights on the burned areas are superior to those on the unburned subplots.

The conclusions to be drawn here are:

1. The delayed germination of Block I is reflected in shorter seedling heights.

2. Heavy shelterwood definitely restricts height growth.

3. At the end of the period of observation, substantial percentages of the best seedlings on a quadrat are being suppressed, particularly on the unburned subplots. Cleaning out of the competing brush is now necessary.

Final List of Fellow Nominations

In the November issue (page 863) was published a list of Members who had been nominated to the grade of Fellow.

The list was incomplete. There follows the final complete list of Fellow nominations. These names duly appeared on the ballot that went to the electors.

Reed W. Bailey, Ogden, Utah
Willis M. Baker, Hiwassee Dam, N.C.
John S. Boyce, New Haven, Conn.
Robert W. Cowlin, Portland, Ore.
Dwight B. Demeritt, Bangor, Me.
Samuel B. Detwiler, Boulder, Colo.
James F. Dubuar, Wanakena, N. Y.
Stanley G. Fontanna, Ann Arbor, Mich.
Bernard Frank, Washington, D. C.
Louis J. Freedman, Old Town, Me.
Charles G. Geltz, Gainesville, Fla.
S. R. Gevorkiantz, St. Paul, Minn.
J. Alfred Hall, Madison, Wis.
James O. Hazard, Nashville, Tenn.
Paul A. Herbert, East Lansing, Mich.
Ernst V. Jotter, Dayton, Ohio.
Willard R. Hine, Atlanta, Ga.
Julius V. Hofmann, Raleigh, N. C.
Carl I. Peterson, Nashville, Tenn.
Frank H. Kaufert, St. Paul, Minn.
F. Paul Keen, Berkeley, Calif.
Chas. J. Kraebel, Berkeley, Calif.
C. Otto Lindh, Albuquerque, N. Mex.
Gordon D. Marckworth, Seattle, Wash.
Arthur C. McIntyre, Harrisburg, Pa.
Nicholas T. Mirov, Berkeley, Calif.
Clarence W. Richen, Portland, Ore.
T. Schantz-Hansen, Cloquet, Minn.
Francis X. Schumacher, Durham, N. C.
T. Edward Shaw, Lafayette, Ind.
Edwin H. Steffen, Pullman, Wash.
Raymond F. Taylor, Juneau, Alaska
Arthur T. Upson, Tucson, Ariz.
John V. K. Wagar, Ft. Collins, Colo.
Philip C. Wakeley, New Orleans, La.
R. H. Westveld, Columbia, Mo.
Herman Work, Staunton, Va.

A Comparison of Three Methods of Eliminating Cull Trees from Woodlands With 2,4,5-T

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The use of 2,4,5-T for deadening cull and weed trees has been widely acclaimed, yet woodland owners in the central hardwood region have been slow to adopt the use of 2,4,5-T for this purpose. The uncertainty that exists with respect to the formulation and application of the compound and the frequently high cost of currently recommended practices are partly responsible for this situation. This article compares the efficiency of several applications and suggests a possible means of reducing the cost.

ESSENTIAL to any forest improvement program and a basic silvicultural practice is the elimination of cull or otherwise undesirable trees from the forest growing stock. Cull trees by virtue of poor form or being large decadent veterans, frequently are the most demanding trees for light, soil moisture and growing space. Growth on these culls is not only worthless, but at the expense of growth on good trees and therefore results in a serious loss in net growth. Cull and weed trees will, as they increase in size, occupy more and more of the available growing space. Elimination of grazing and cull trees is the first and most important step in making many woodlands fully productive.

Objective

Hormone-type herbicides used as silvicides show great promise, even though experimental results often appear to be inconsistent. Results have varied for reasons such as differences in formulation and strength of the chemical used, method and season of application, tree species involved and locality. Formulations of low-volatile esters of 2,4,5-trichlorophenoxyacetic acid have proved to be among the most effective silvicides.

The objective of this study, which was conducted in conjunction with a cull and weed-tree removal program in a central Illinois woodland, was to test the effectiveness and efficiency of three different methods of applying 2,4,5-T during the dormant season.

Since the release of growing space through the elimination of undesirable trees at a low cost was the primary aim, rapidity of kill and complete prohibition of sprouting, while considered desirable, were not essential to the success of the treatments.

Methods

A kerosene solution of 2,4,5-T[2] containing 16 pounds of 2,4,5-T acid equivalent per hundred gallons of solution, which is a commonly accepted standard strength for basal sprays, was tested in four treatments. Each treatment was replicated in the three distinctly different stand conditions to insure representative distribution of species and stand conditions. The treatments were as follows:

Treatment A.—Basal spray application on trees 3 to 10 inches in diameter. The trunks of the trees were thoroughly wetted to the point of runoff to a height of 18 inches above the ground line.

Treatment B.—Cornell tool[3] application on trees 3 to 10 inches in diameter. Contiguous strikes through the bark completely encircled the trunk at a height above the ground line approximately equal to the stump diameter.

Treatment C.—Ax frill and spray application on trees 10 to 20 inches in diameter. A spray directed into the frill cut through the bark completely around the trunk at a height of 18 inches above the ground line.

Treatment D.—Cornell tool application on trees 10 to 20 inches in diameter. Similar to Treatment B.

All spraying was done with a three-gallon hand sprayer.

Treatments *A* and *C* were on the same areas; likewise Treatments *B* and *D* were on the same areas. Trees were located and treated as they would be in practice. On a given area an attempt was made to treat the 3- to 10-inch trees before beginning to treat the 10- to 20-inch trees. A certain amount of over-lapping between diameter groups was unavoidable.

All trees in the experiment were measured at breast height and were numbered and tagged with aluminum tags for future identification. The 522 trees in the experiment, which were on a 25-acre tract, were treated on February 12 to 15, 1952.

The time required to complete the treatments exclusive of walking time was observed and recorded for individual trees. Total elapsed time, including preparatory and refill time but excluding nonoperative or ineffective time, was observed and recorded by treatments.

Solution requirements were measured and recorded by treatments.

Observation of Results

The results of treatments were observed on July 7-8, 1952; September 16-18, 1952; July 27-28, 1953; and June 26, 1954.

At each of the above dates treated trees were rated according to a degree of injury scale ranging from 0 through 10.

[1]Research associate in forestry and professor in forest research, Department of Forestry.

[2]Esteron 245 (propylene glycol butyl ether esters of 2,4,5-trichlorophenoxyacetic acid) supplied through the courtesy of Dow Chemical Company.

[3]A tool devised by Cope and Spaeth for applying sodium arsenite consisting of a 5-foot 1.25-inch steel pipe fitted with a curved cutting spud on its lower end. In operation the impact of the downward thrust activates a spring valve which releases small quantities of the poison, held in the handle, to run down the face of the spud into the cut.

Cope, J. A., and J. N. Spaeth. The killing of trees with sodium arsenite. Jour. Forestry 29:775-783. 1931.

DEGREE OF INJURY SCALE

0—No apparent defoliation
1—5 to 15 percent defoliation
2—15 to 25 percent defoliation
3-8—Increasing by 10 percent
9—85 to 100 percent defoliation
10—Complete top kill including cambium

No effort was made to determine the effect of treatments on root systems other than to note the presence and nature of sprouts and suckers.

Discussion of Results

Effectiveness of treatments.—The results of treatments are summarized and presented in Table 1 by species as the average degree of injury observed.

The effect of all treatments extended into or did not become apparent until at least the middle of the third growing season after treatment.

More rapid and thorough top kills were obtained with the basal spray and frill and spray treatments than with the Cornell tool treatments. Of the 128 trees given the basal spray treatment, only one, a 9-inch elm, survived with only partial defoliation into the third growing season. Of the 132 trees given the frill and spray treatment, only two 14-inch hickories survived with only partial defoliation into the third growing season. The principal failure of the Cornell tool was that its use did not result in satisfactory top kill in hickory. For all oaks treated with this tool, the degree of injury was rated as 9.4, which was considered quite satisfactory for management purposes.

The effect of tree size on the effectiveness of the treatments was not apparent except in the case of the Cornell tool applications on hickory, which were slightly more effective on the smaller diameter trees.

Weak basal sprouts were observed in June 1954 on 1.6 percent, 8.3 percent, and 8.0 percent of the trees treated by the basal spray, frill and spray, and Cornell tool methods, respectively. The lesser amount of sprouting resulting with the basal spray method is believed to be due largely to the killing of adventitious or dormant buds in the vicinity of the root collar from external contact with the 2,4,5-T. Sprouts present at one observation were frequently dead at the next observation. The amount and nature of the sprouting was such as to be considered of no practical importance.

Cost of treatments.—Theoretically the quantity of liquid required to wet the trunks of trees to a given height is directly proportional to their diameters. In practice, however, larger trees with thicker and more irregular bark would tend to require additional amounts of liquid. To a certain degree this tendency is offset by the waste on small trees resulting from the smaller spray target. For the purpose of this study, the solution requirements were assumed to be directly proportional to tree diameter. The near equal dosages for Treatments *B* and *D* proved the assumption to be reasonable for at least the Cornell tool applications. In terms of average solution requirements per inch of breast height diameter, the dosages for treatments were as follows:

Treatment *A*—Basal spray on 3- to 10-inch trees—72.0 milliliters;

TABLE 1.—AVERAGE INJURY RATINGS BY SPECIES AND TREATMENTS FOR THREE METHODS OF APPLYING 2,4,5-T TO CULL AND WEED TREES

	Species																	
	Hickory		Post oak		Black jack and shingle oak		White oak		Black and red oak		Elm		Ash		Walnut, mulberry, box elder, hackberry, sassafras		All species	
Date of observation	No. obser.	Rating	No. obser.	Rating	No. obser.	Rating	No. obser.	Rating	No. obser.	Rating	No. obser.	Rating	No. obser.	Rating	No. obser.	Rating	No. obser.	Rating
BASAL SPRAY ON TREES 3 TO 10 INCHES IN DIAMETER (72 M.L. SOLUTION/INCH OF DIAMETER)																		
July 7-8, 1952	65	4.2	15	9.9	26	9.6	11	9.3	6	10.0	1	2.0			4	9.2	128	6.8
Sept. 16-18, 1952		9.1		10.0		10.0		10.0		10.0		4.0				10.0		9.5
July 27-28, 1953		9.8		10.0		10.0		10.0		10.0		4.0				10.0		9.9
June 26, 1954		10.0		10.0		10.0		10.0		10.0		1.0				10.0		10.0
CORNELL TOOL ON TREES 3 TO 10 INCHES IN DIAMETER (4.5 M.L. SOLUTION/INCH OF DIAMETER)																		
July 7-8, 1952	82	0.2	13	8.0	23	6.2	8	6.4	9	7.0	3	3.3	2	0.5	14	3.4	154	2.8
Sept. 16-18, 1952		1.8		8.5		7.9		8.6		7.4		4.7		2.5		4.3		4.2
July 27-28, 1953		3.0		8.6		9.5		8.8		8.8		6.7		7.0		5.7		5.5
June 26, 1954		4.7		8.6		9.8		8.9		9.8		6.7		4.0		8.6		6.6
AX FRILL AND SPRAY ON TREES 10 TO 20 INCHES IN DIAMETER (27 M.L. SOLUTION/INCH OF DIAMETER)																		
July 7-8, 1952	19	1.0	7	9.9	70	6.7	5	8.4	21	9.8	8	6.9	1	5.0	1	10.0	132	8.2
Sept. 16-18, 1952		3.4		10.0		10.0		10.0		10.0		8.9		6.0		10.0		8.9
July 27-28, 1953		7.7		10.0		10.0		10.0		10.0		9.9		9.9		10.0		9.6
June 26, 1954		9.8		10.0		10.0		10.0		10.0		10.0		10.0		10.0		10.0
CORNELL TOOL ON TREES 10 TO 20 INCHES IN DIAMETER (4.7 M.L. SOLUTION/INCH OF DIAMETER)																		
July 7-8, 1952	20	0	2	9.5	56	6.8	1	4.0	15	4.1	5	0.8	3	0.3	6	5.8	108	4.7
Sept. 16-18, 1952		0.2		10.0		9.0		10.0		4.5		4.4		2.0		6.3		6.2
July 27-28, 1953		0.4		10.0		9.8		10.0		6.0		4.6		4.7		4.5		6.9
June 26, 1954		1.0		10.0		9.9		10.0		8.0		7.8		3.3		9.8		7.7

Treatment *B*—Cornell tool on 3- to 10-inch trees—4.5 milliliters;
Treatment *C*—Frill and spray on 10- to 20-inch trees—27.0 milliliters;
Treatment *D*—Cornell tool on 10- to 30-inch trees—4.7 milliliters.

Least-squares solutions for the regression of average treating times for trees of given diameter classes over their respective diameters resulted in good fits throughout the range of data for each of the four treatments. The plotted averages with their regression lines are shown in Figure 1. Since the regression line for Treatment *D* was almost an exact extension of the line for Treatment *B*, a single regression line was computed for the two Cornell tool treatments. The computed regression equations with their standard errors are as follows:

Basal spray $T = 2.75D + 12.1 \pm 4.0$
Frill and spray $T = 4.39D + 14.1 \pm 6.2$
Cornell tool $T = 8.18D - 0.2 \pm 4.6$

where T equals the time in seconds required to treat a tree D inches in diameter at breast height.

The relative costs of treatments based on the above formulae and the average solution requirements were computed. These cost data, presented in Table 2, are based on wages at $1.25 per hour and the prepared solution at 70 cents per gallon. Comparative costs for other solution strengths and hourly labor costs can be obtained in a similar manner.

The relative labor costs indicated in Table 2 do not include preparatory, walking, and refill times. The difference between the time accounted for in Table 2 and the total elapsed effective operative time averaged approximately 60 seconds per tree for the basal spray and Cornell tool treatments and 90 seconds for the frill and spray treatment. If these times are added at the rate of two cents a minute to the relative costs in Table 2, total treating costs per tree can be estimated.

Yocum[4] has published formulae predicting man-hour requirements for machine girdling (Little Beaver) and for notch girdling with a hand ax. These formulae converted to labor cost at the rate of $1.25 per man hour are:

Cost of machine girdling in dollars = $(.0046D - .010)\ (N)$
Cost of hand girdling in dollars = $(.0075D - .013)\ (N)$

where D equals average diameter, and N equals number trees girdled. These costs, if compared with those in Table 2, illustrate that the indicated labor saving for the basal spray and frill and spray methods is more than offset by solution costs. Over-all costs of the Cornell tool method, including preparatory, walking, and refill times, are approximately equal to the labor and machine cost of the "Little Beaver" girdling method. Preliminary tests indicate that higher concentrations of the solution may be used in the Cornell tool without materially increasing cost, because of the low volumes required and the possibility of eliminating the necessity of contiguous strikes completely around the trees.

The amount of release may be expressed in terms of basal area of trees removed from a stand as is commonly done in thinning practice. The relative treating costs from Table 2 for trees of various diameters, expressed as costs per square foot of basal area treated, are shown in Figure 2. Release costs are shown to rise with decrease in tree diameter. Their rise is particularly noticeable with diameter decreases under 10 inches.

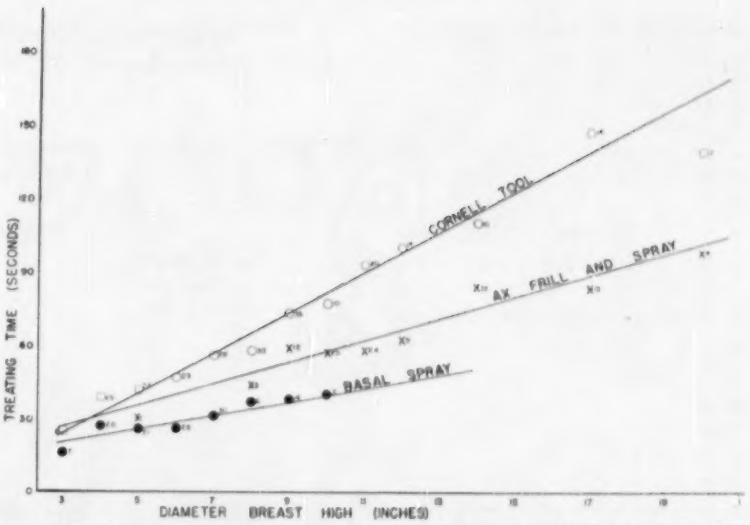

FIG. 1.—Relative time to treat trees of various diameters by the basal spray, frill and spray, and the Cornell tool methods.

Conclusions

1. The basal spray and frill and spray applications of kerosene solutions of 2,4,5-T (containing 16 pounds of acid equivalent per 100 gallons) resulted in almost complete top kills with all species tested. The rapidity and thoroughness of top killing indicate that the concentration of the solution was more than ample to bring about the desired result. The results suggest that lower 2,4,5-T concentrations, perhaps 12 pounds of acid equivalent per 100 gallons of solution, would have given a satisfactory amount of top killing.

2. The Cornell tool applications of the same solution resulted in

TABLE 2.—FORMULAE FOR COMPARING RELATIVE COSTS OF TREATMENTS

Treatment	Cost in dollars per tree		
	Labor	Solution	Total
Basal spray	$.0010D^1 + .0042$	$.0135D$	$.0145D + .004$
Frill and spray	$.0015D + .0049$	$.0050D$	$.0065D + .005$
Cornell tool	$.0028D - .0007$	$.0009D$	$.0037D - .001$

[1] D is the breast-high diameter in inches. To determine relative costs for a group of trees, substitute their mean diameter for D.

[4] Yocum, H. A. Machine faster than ax in girdling. Jour. Forestry 53:205-206. 1954.

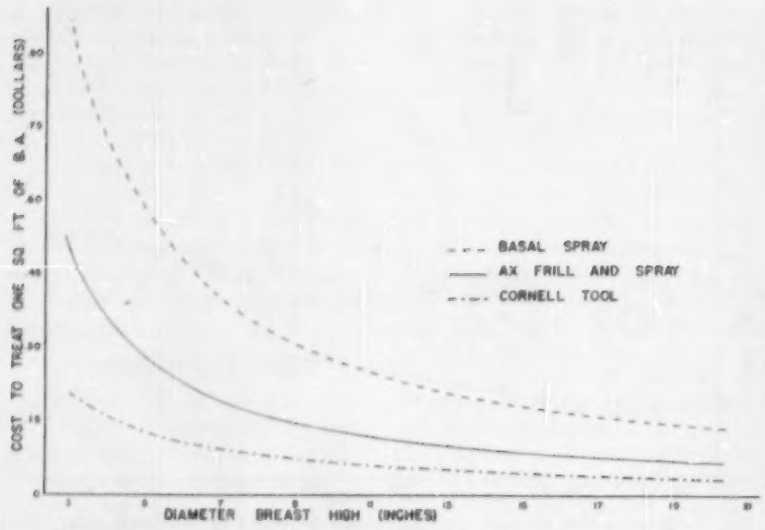

FIG. 2.—Relative cost to treat one square foot of basal area for trees of various diameters by the basal spray, frill and spray, and the Cornell tool methods.

FIG. 3.—Portability, ease of operation, and low solution requirements are advantages of the Cornell tool. Additional studies to increase its effectiveness are warranted.

somewhat slower and poorer results than either the basal spray or frill and spray method. The satisfactory top killing obtained by this method with the oak species is indicative that considerably better results might be expected with stronger solutions and perhaps without the necessity of contiguous strikes.

3. The amount and nature of sprouting subsequent to any treatment was considered to be of no practical importance to forest management. The lesser amount of sprouting in the case of the basal spray treatment is believed to be due mainly to the killing of dormant or adventitious buds in the vicinity of the root collar through external contact with 2,4,-5-T.

4. Labor and solution costs bear a direct linear relationship to tree diameter. Therefore, the unit cost of release in terms of basal area is inversely related to the square of the diameter.

5. The basal spray application was one of the most effective in bringing about top killing; however, because of the large solution requirements, it was the least efficient application from the standpoint of cost.

6. More efficient methods of applying 2,4,5-T are needed. Low concentrations at high dosage rates, which have been recommended for basal sprays by Coulter[5] and others, become impractical and costly for cull and weed-tree elimination. The results of this study suggest that high concentrations applied at low dosage rates by the Cornell tool or other means hold great promise.

[5]Coulter, L. L. Two primary factors influencing the results in the control of oak during the dormant period. Down to Earth, Vol. 7, No. 4, pp. 2-3. 1952.

Found

Will the Society member who inquired at the annual meeting registration desk at Portland, Oregon, about a lost article at Oaks Park (barbecue night) please communicate with Miss Audrey Warren, Society of American Foresters, Washington 6, D. C.

Effects of Prescribed Burning on Soil Fertility in Second Growth Ponderosa Pine[1]

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PRESCRIBED BURNING may serve as a tool in brush control and manipulation in second-growth ponderosa pine.[2] If so, it is important to know the effects of such fires on the fertility of the soil. Therefore, a study was undertaken to determine the immediate effects of prescribed burning on the nutrient status of soils. Further work is in progress to determine the long term effects of occasional and repeated burning.

Many aspects of the effects of burning on soil properties are still in a state of uncertainty. One of the more consistent findings relates to soil reaction. It is almost uniformly agreed that burning produces an increased alkalinity of the surface soil (*3, 13, 20, 27*). A few studies found no significant change in the pH of the soil (*4, 19*). One investigator found a higher pH as a result of burning on acid soil, but little effect on neutral soils (*11*).

The influence of fire in increasing the nitrate supply or nitrification in soil also seems fairly well established (*2, 6, 12, 21*). On the other hand, burning was found to have no effect on ammonification (*12*), or to decrease it slightly (*17*).

The base status of the soil, especially with regard to calcium and potassium, is increased following a burn (*6, 14*). An increase in available phosphate has been found (*17*), but the preponderant evidence points to no appreciable change in this nutrient (*6, 7, 14, 19*).

The productivity of the soil as measured by plant growth for the most part has been found to increase for a while, at least, as a result of burning (*9, 10, 16, 18, 26*).

FIG. 1.—The first phase of the burning operation. This is done after enough rainfall to wet the duff to the mineral soil and after the top pine needles are dry.

In other studies a decrease was found (*8, 28*), and in a few instances no change at all has been found (*1, 19, 22*). One report gave a decrease in growth for some plants and no difference for other crops (*24*).

Prescribed Burning

This study originated in connection with a cooperative effort with the California Department of Fish and Game to study the effect of brush removal and manipulation on wildlife populations. Although the research is concerned chiefly with brush control and successions and with game, the work is being done from the standpoint that all wildland resources on an area are interdependent and must be considered together (*5*).

One of these resources is the soil, and a study of the fertility of the soil as it is affected by prescribed burning forms the purpose of this investigation.

For the past three years there has been under way a study of brush manipulation in second-growth ponderosa pine growing on Salminas soil at Hoberg's in the Coast Ranges of northern California, and on Holland soil in the Teaford Forest near Northfork on the western slope of the central Sierra Nevada Mountains.

The prescribed burning operation consists of two parts. First, broadcast burning is done after rainfall, at a time when the top pine needles on the forest floor are dry, but the duff to the mineral soil is still wet (Fig. 1). It is preferable to have a humidity above 25 percent, and an air temperature below 65 degrees. The burning is done downhill, and in the absence of high wind.

Second, cleanup burning is done on the remaining coarse material which is piled as it is burned in small heaps. This phase can be performed under a wider range of climatic conditions than the broadcast burning, but caution must be used in the location of the piles to prevent scorching of surrounding tree trunks. The combustible material consists of needles and leaves, twigs, and debris from conifers and hardwood trees, and dead brush plants such as manzanita (*Arctostaphylos* spp.) and deer brush (*Ceanothus integerrimus*) (Fig. 2).

Soil samples were taken from areas that had been broadcast burned and also from places where dead brush and other debris had been piled and burned, referred to hereafter as light burn and heavy burn. A control sample was collected from an adjacent unburned area. The soils were collected from areas which had been burned one year and two years previously. Each soil type and treatment was sampled in triplicate.

After the remaining litter and ash were swept aside, the mineral soil was sampled at two depths, the top eight inches, and the next eight inches. The soil was transported in burlap sacks to Berkeley where it was assayed in the greenhouse for fertility by means of a pot testing technique.

[1]A portion of this research was done under Federal Aid in Wildlife Restoration Act, Project California W 31-R.

[2]Prescribed burning is defined as the application of fire to land under such conditions of weather, soil moisture, time of day, and other factors as presumably will result in the intensity of heat and spread required to accomplish specific silvicultural, wildlife, grazing, or fire-hazard reduction purposes.

FIG. 2.—Before (*left*) and after prescribed burning to reduce fire hazard and improve conditions for game.

Description of Soils Studied

The Holland soil from the Teaford Forest in the Sierras is a sandy loam formed in place on weathered granitic rocks. It is slightly acid and occurs to a depth of 2 to 3 feet with a slight profile development. The acreage is extensive in the Sierra Nevada foothills, the Coast Range, and the mountains of southern California (*23*).

The Salminas loam from Hoberg's in the Coast Ranges is formed in place from andesite rocks. It is moderately acid and has a depth of 3 to 4 feet with very little differentiation in the profile. This soil has not been mapped extensively as yet, but with closely allied soils such as those of the Aiken series, a large acreage is found in the mountains of the Coast Ranges and the foothills of the Sierra Nevada Range.

Pot Test of Soil Fertility

The pot test is performed in a greenhouse and has been used for several years in California to study the nutrient levels of agricultural soils (*15*). The greenhouse results have been correlated with field trials so that it is useful in practice to estimate the field needs of soils for fertilization. This correlation may not be applicable to soils supporting forest trees, but the method may still provide a useful index in appraising relative changes in soil fertility induced by certain treatments such as prescribed burning.

About 4 pounds of soil are weighed into 6-inch pots, and this serves as a check. A complete fertilizer treatment is then set up containing nitrogen, phosphate, and potash. In subsequent treatments one of these nutrients at a time is omitted so that the supplying power of the soil for each element is tested in the presence of adequate amounts of the other two. Lettuce and barley are planted in separate pots, and after 6 weeks of growth, the plants are harvested and the dry weights are recorded. The lettuce is planted as seedlings in triplicate pots with 1 plant per pot, and the barley is planted as seed in duplicate pots to produce 5 plants per pot.

TABLE 1.—LETTUCE AND BARLEY YIELDS FROM HOLLAND SOIL SAMPLED ONE YEAR AFTER BURNING (8"-16" SOIL DEPTH)

Nutrient treatment	No burn		Light burn		Heavy burn	
	Lettuce	Barley	Lettuce	Barley	Lettuce	Barley
	Average dry weights in grams per pot					
$N_0P_0K_0$	0.2	0.4	0.6	0.5	0.6	1.3
$N_0P_2K_2$	2.7	2.6	2.4	2.2	3.0	2.7
$N_2P_0K_2$	0.4	0.5	0.9	1.0	1.4	1.3
$N_2P_2K_0$	0.2	0.6	0.5	1.5	1.1	2.5
$N_2P_2K_2$	2.5	2.0	2.3	2.0	2.9	2.4

Results of the Pot Tests

The dry weights of lettuce and barley plants grown in the pot tests of the Holland soil (9-8") are given in Figure 3. The tests were made on three different soil samples taken from each field plot.

The results from the control sample which received no burning treatment in the field indicate that the soil originally was quite low in nitrogen and phosphate, but adequate in potash. The yields from the complete fertilizer are fair compared to those obtained from agricultural soils tested in the greenhouse at the same time. The unfertilized pots gave very low yields of lettuce and barley, reflecting the low N and P status of the soil. The relations indicated above applied equally to the sub-soil samples (Table 1).

The soils from the heavy burn plots showed a substantial increase in both the nitrogen and phosphate supplying power of the soil from the surface 8 inches, and a more modest increase in both these nutrients in the subsoil compared to the control soil from the no burn plots. No change was detected in the potash supply, and this is due to the fact that this nutrient was already adequate in the control soil. Under these circumstances a potash change would be demon-

strated more readily by a chemical analysis of the soil rather than by a growth test. There was no significant change between the yields of the complete fertilizer, but there was a sizable increase in the check pots, reflecting the increased nitrogen and phosphate supply in the heavy burn soil.

The light burn soils showed an increase in nitrogen and phosphate which was intermediate between the no burn and heavy burn treatments.

These results were obtained on soils collected one year after burning. In order to determine the duration of the nitrogen and phosphate responses, similar pot tests were made on soils which had been burned 2 years previously. The data obtained from this test are shown in Table 2. The increase in nitrogen and phosphate was considerably smaller than had been found on the one-year burns.

TABLE 2.—LETTUCE AND BARLEY YIELDS FROM HOLLAND SOIL SAMPLED TWO YEARS AFTER BURNING

Nutrient treatment	No burn		Light burn		Heavy burn	
	Lettuce	Barley	Lettuce	Barley	Lettuce	Barley
	Average dry weights in grams per pot					
	0-8" SOIL DEPTH					
$N_0P_0K_0$	0.1	0.4	0.5	0.5	0.1	0.6
$N_2P_2K_2$	2.9	2.8	2.4	2.2	2.7	2.5
$N_0P_2K_2$	0.6	0.5	1.3	0.6	0.6	0.6
$N_2P_0K_2$	0.2	0.6	0.3	1.1	0.1	1.1
$N_2P_2K_0$	2.6	2.7	2.4	1.8	2.7	2.3
	8"-16" SOIL DEPTH					
$N_0P_0K_0$	0.2	0.4	0.2	0.3	0.3	0.4
$N_2P_2K_2$	2.7	2.6	2.7	2.9	2.6	2.5
$N_0P_2K_2$	0.4	0.5	0.7	1.0	1.0	1.1
$N_2P_0K_2$	0.2	0.6	0.2	0.6	0.1	0.7
$N_2P_2K_0$	2.5	2.0	2.6	2.8	2.6	2.1

The burn plots of the Salminas soil were also sampled and the soils tested for nutrient response. The results appear in Figures 4 and 5, and they confirm the increase in nitrogen supply found in the Holland soil as a result of burning. On the other hand, there is no appreciable increase in the available phosphate as had been found on the previous soil. This contradiction in the phosphate supply of the two soils serves as a good example of the varied results which have been reported with respect to many soil responses as a result of burning.

A possible explanation of this

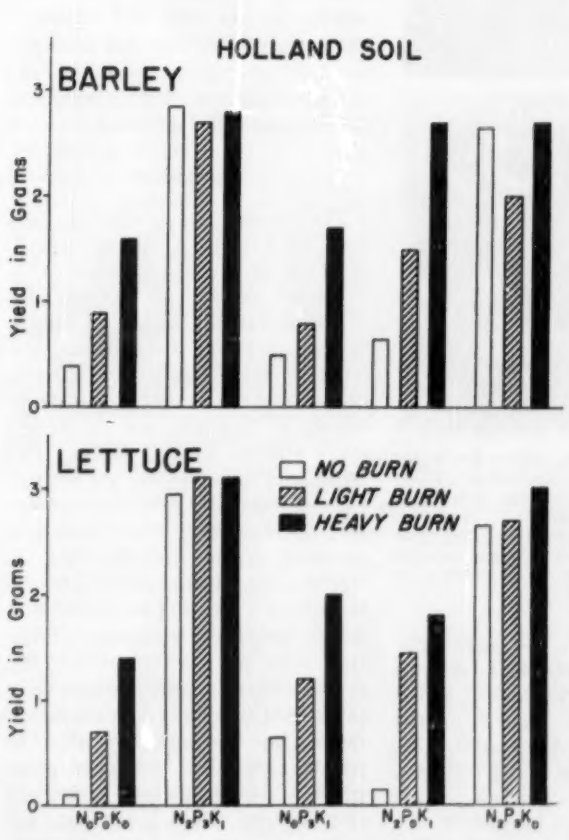

FIG. 3.—Average dry weights of lettuce and barley grown in pots of Holland soil (0-8") sampled 1 year after burning.

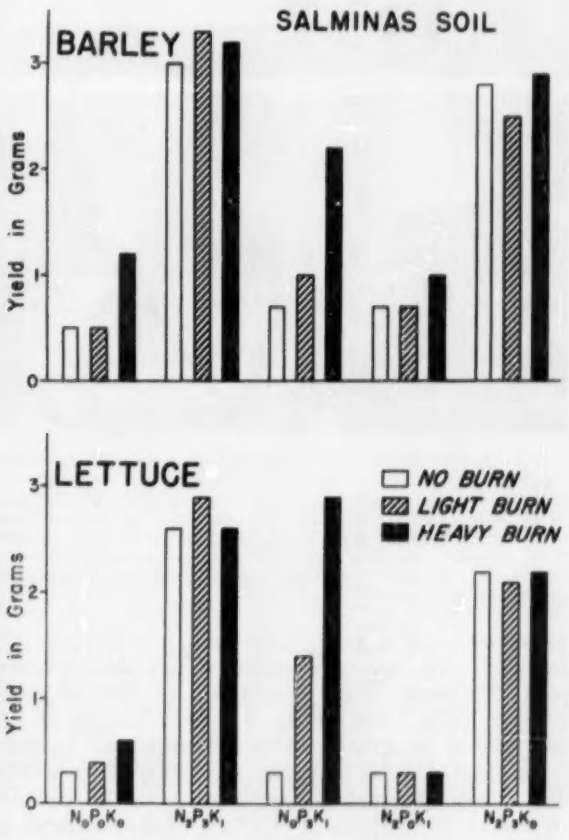

FIG. 4.—Average dry weights of lettuce and barley grown in pots of Salminas soil (0-8") sampled 1 year after burning.

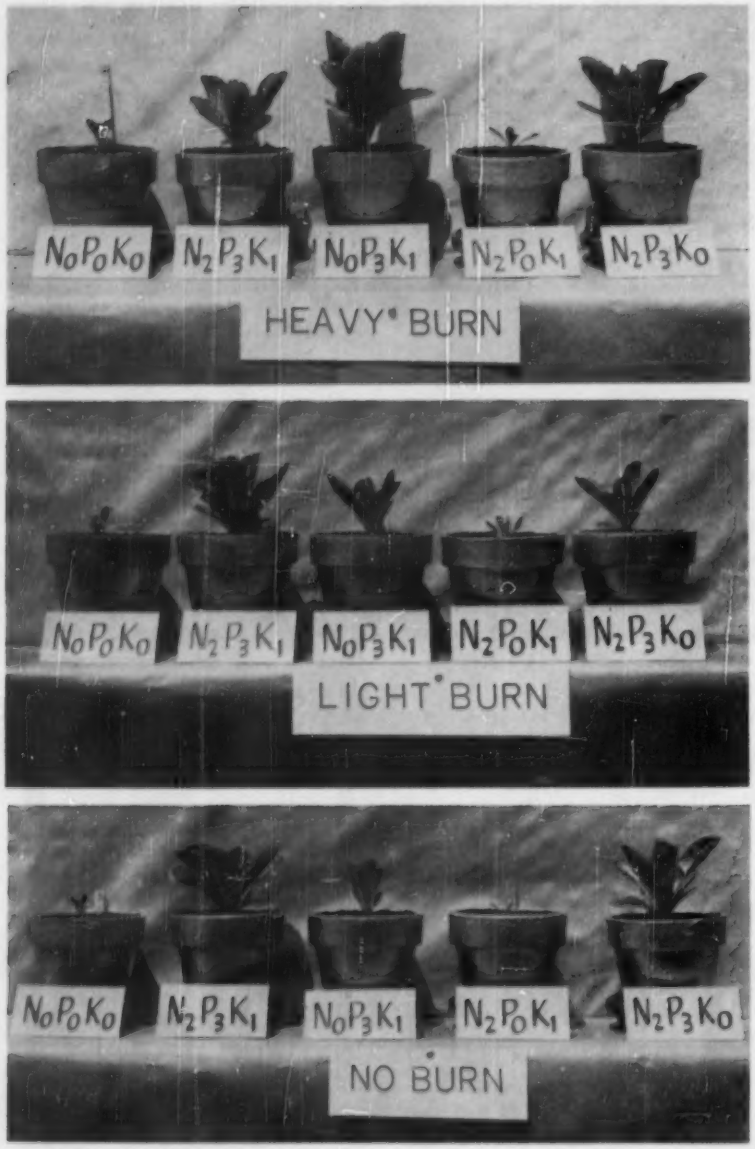

FIG. 5.—Lettuce growing in pots of Salminas soil (0-8") sampled 1 year after burning. Rate of nutrients added: N_2 = 200 lbs. N per acre added as ammonium nitrate, P_3 = 300 lbs. P_2O_5 added as calcium dihydrogen phosphate, K_1 = 100 lbs. K_2O added as potassium sulfate. Subscript zero indicates no nutrient added.

In the hot burn set the plants with complete fertilizer were actually smaller than those grown in the treatment with nitrogen omitted. This often happens on acid soils high in nitrogen due to the increase in activity produced by the application of ammonium nitrate fertilizer.

phosphate discrepancy may be found in the nature of the two soils. The Salminas soil is a phosphate-fixing soil that ties up large amounts of phosphate which are not readily available to plants. The Holland soil does not fix phosphate to such a large extent and much of the phosphate that is added to it is available to plants.

In order to test this hypothesis a laboratory test was made. Known amounts of phosphate were added to samples of soil taken from the surface 8 inches. After an incubation of 24 hours at room temperature, the availability of phosphate was measured by means of the Truog chemical test (*25*). This method has been found reliable in measuring the availability of phosphate in soils as related to plant response.

The data obtained are given in Figure 6. They show that when various amounts of phosphate are added to the Holland soil, the amount of this nutrient extracted rises sharply with the amount added. On the other hand, the Salminas soil fixes large amounts of phosphate, so that at the low levels of this compound added there is just a small amount available. Only when the applied phosphate reaches 300 lbs. per acre does the availability reach a high value.

Interpreting this in terms of prescribed burning, the explanation may be offered that assuming equal amounts of phosphate are added by the combustion of organic matter on the two soils, the Salminas soil ties up a large fraction of this substance, while the Holland soil leaves it available for plant growth. This would explain why the Holland soil showed a substantial increase in phosphate supply, while the Salminas soil showed very little change due to prescribed burning.

Discussion

The increase in available nitrogen found in these soils as a result of burning is in agreement with previous work done largely by chemical analysis and occasionally by crop growth. In addition, the burning treatments showed a large increase in the available phosphate supply of one soil and no significant change in the other. The phosphate situation has not been as fully explored by previous workers as has the nitrogen effect, and in a majority of the investigations no significant change in phosphate had been found. In this study the different phosphate responses of the two soils are explained on the grounds that one of these soils fixes phosphate to a high degree and reduces the amount available to plants especially when the phosphate added is not very large.

The data obtained in these experiments are the result of a controlled type of burning performed

in a prescribed manner. However, this being a field operation, there is necessarily a wide latitude in the execution of the recommended procedure for burning. This may in part account for the greater variability shown by the pot tests than would ordinarily be expected in a greenhouse or laboratory study.

Likewise this may be a major reason for the great divergence of opinion in the literature as to the effect of burning on certain properties of the soil. In other words, the differences in type and amount of vegetation, intensity of burn, intensity and frequency of rainfall, other climatic factors, and the nature of the soil, may add up to give results which will vary with the circumstances. Once these conditions are defined it may be possible to anticipate this or that effect as a result of forest or brush burning.

Summary

A study was made of the effect of prescribed burning on the fertility of two soils in widely separated areas.

Soil samples were collected at two successive depths of 8 inches from two forests of ponderosa pine. Two intensities of burning were studied, a light burn from an area burned broadcast, and a heavy burn at a spot where debris had been piled during burning. Unburned soil samples were also collected for purposes of comparison.

The soils were assayed for soil fertility by means of a greenhouse pot testing procedure to determine the nitrogen, phosphate, and potash supplying power of the soils.

The unburned soils assayed low in nitrogen and phosphate as measured by the growth of lettuce and barley. The potash supply was adequate so this precluded any measure of changes in this nutrient by the method used.

The heavy burn soils showed an increased nitrogen supply over the light burned, and the latter over the unburned soil. The effect was greater in the surface soil than in the subsoil. The results were less pronounced on the two-year burn than on the one-year burn.

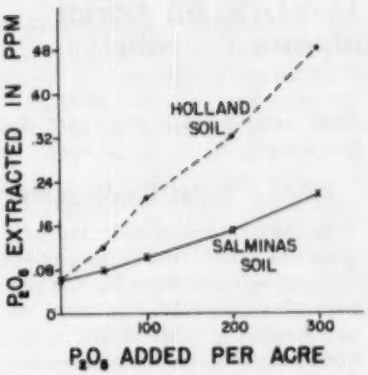

FIG. 6.—Available phosphate extracted by the Truog method following addition of four rates of phosphate to unfertilized Holland and Salminas soil samples.

One of the two soils showed a marked increase in phosphate as a result of burning. The other soil showed no significant change in the phosphate supply as a result of burning. It was suggested that this discrepancy in phosphate response might be due to the tendency of one of these soils to fix large amounts of phosphate, so as to make it unavailable for plant growth.

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A Method of Plotting a Dot Grid on Aerial Photographs of Mountainous Terrain

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AN ACCURATE estimate of forest area is an essential part of any reliable timber survey. This is so because volume estimates are usually based upon a rather limited sample of the timber on the ground. The volume data obtained on the sample cruise must, therefore, be expanded or "blown up" to represent the entire forest. The expansion factor is dependent upon the relationship between the area sampled and the total forest area. Although there are other items, such as volume tables, that affect the accuracy of the timber cruise, none are more important than a correct estimate of total forest area used in computing the expansion factor.

Dot grids printed on vertical aerial photographs provide a rapid and low-cost method of estimating forest area in regions having flat or gently rolling terrain. However, in mountainous topography where forest and nonforest land is arranged in bands or strips this systematic dot grid method results in biased sampling unless the dot locations are corrected for relief displacement.

Effect of Relief Displacement

In the mountains, only those objects that are at the reference elevation used in computing the photograph scale will be in their correct positions. Objects higher and not directly under the camera lens at the time the photograph was taken will be too far from the photograph center, and objects that were lower and not directly under the camera lens will be too close to the photograph center. These image displacements, combined with scale differences caused by elevation changes, result in noncompensating errors in area estimates where forest type or land-use classes are stratified by elevational levels.[1]

A good example of this can be found in the Appalachian Mountains of Virginia and North Carolina. Here, nonforest land is predominantly along the fertile valley bottoms and forest land is above this or on the mountainsides and dry ridge tops. Theoretically, because it is closer to the camera, most of the forest land will be photographed at a larger scale than nonforest land. This, plus the fact that mountain forest areas are displaced anyway, gives a distorted picture of the forest area on the photograph. If a dot grid is superimposed on an aerial photograph in this terrain, too many dots will fall on the forest land and the sample will not be representative. Furthermore, samples selected for field checking will show a greater proportion of mountaintop forest types than actually occurs.

To overcome these limitations, a new and more exact method was developed to transpose the dots in a regular grid pattern to their correct topographic position on aerial photographs. The foundation for

[1] Wilson, R. C. The relief displacement factor in forest area estimates by dot templ'ate on aerial photographs. Photogrammetric Engineering 15:225-236. 1946.

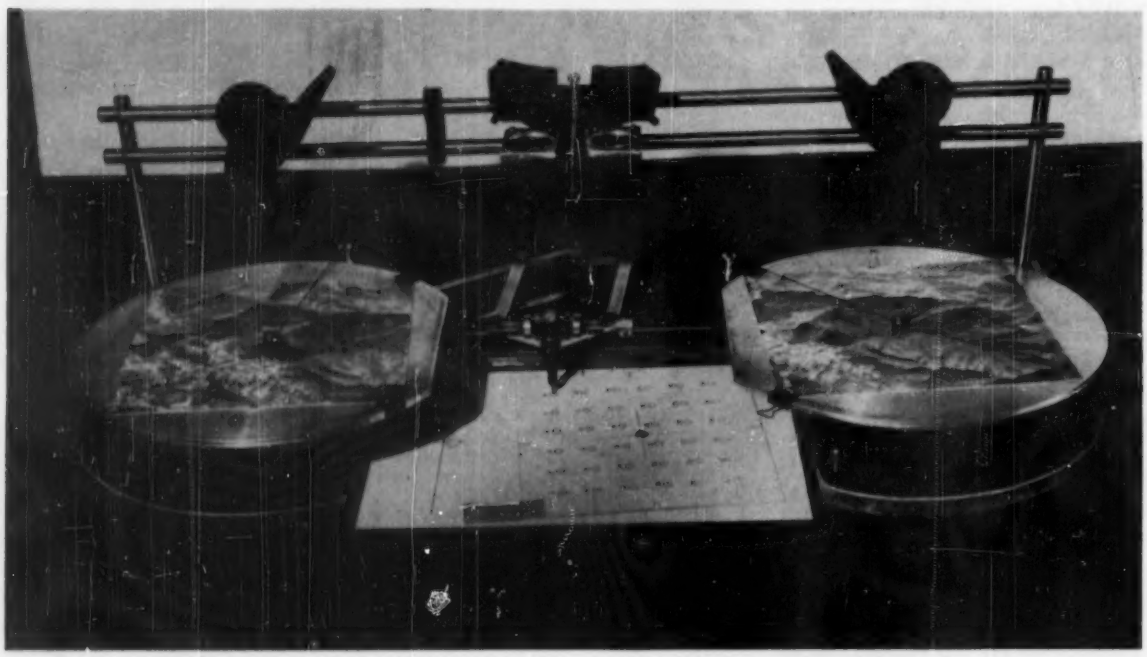


FIG. 1.—The Radial Planimetric Plotter after modifications for plotting the dot grid.

this method is the Radial Planimetric Plotter (Fig. 1).

The Radial Planimetric Plotter

The Radial Planimetric Plotter is described by the manufacturer as a stereoscopic instrument designed to draw planimetric detail directly onto a map sheet from stereoscopic pairs of aerial photographs. It removes the perspective or distortions due to differences in ground elevation and corrects for differences in scale between photographs.

In principle, this instrument performs as any transit or plane table in triangulation. That is, the true position of any point can be found at the intersection of angles radiating from two or more known stations. In adapting this instrument to the problem of spotting a grid of dots on aerial photographs, we are putting the instrument to work in reverse. We know the true planimetric position of the dots represented by the regular grid pattern and want to find their correct photographic location. By substituting a dot grid pattern for a map sheet and then moving the drawing pencil to each successive dot in the grid, we can spot the dot locations on the photographs by a pin-prick at the intersection of the radial lines viewed through the stereoscope on the instrument.

Adapting the Plotter

Briefly, adapting the plotter was accomplished in these five steps:

1. The transparent radial arms were removed from the plotter and replaced by medium-weight, red nylon thread. This made it possible for the operator to pin-prick the dot locations at the intersection of radial lines.

2. The lead was removed from the plotter drawing pencil and re-

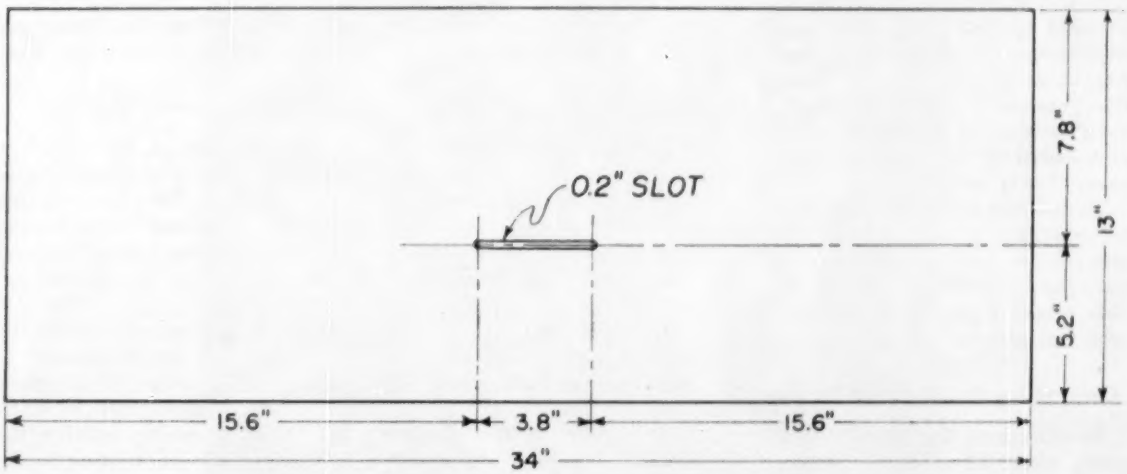


FIG. 2.—Hardboard base for the radial planimetric plotter.

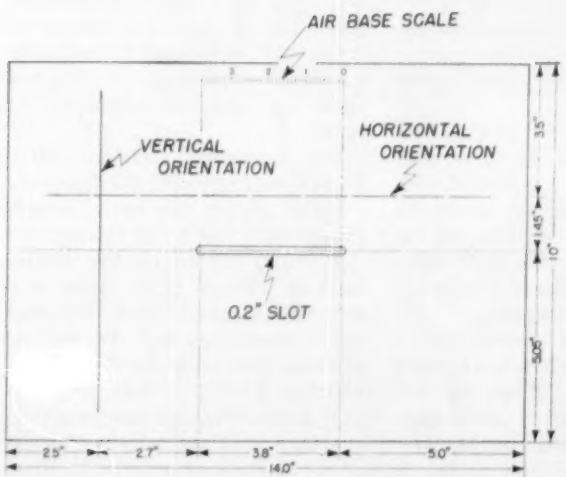


FIG. 3.—The dot grid guide.

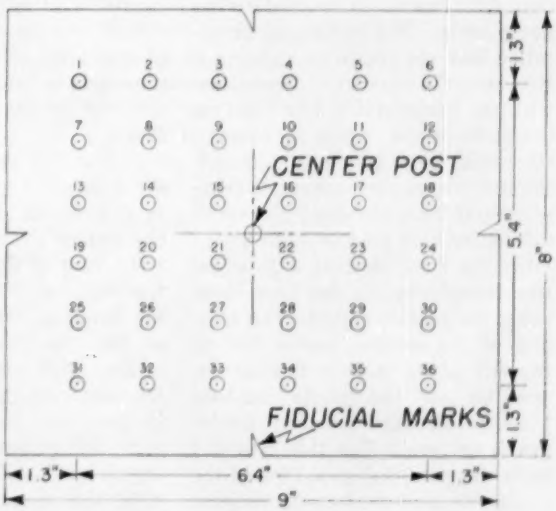


FIG. 4.—A 36-dot grid.

placed with a steel compass point. With this point each position of the plotter on the grid was made secure while the operator marked the dot location on the photograph.

3. A base was constructed from a piece of ⅛-inch hardboard. This base was large enough to support the entire plotter and was provided with a slot to accommodate the center post of the dot grid (Fig. 2).

4. A guide for orienting dot grids on the instrument base was prepared from a multilith zinc photographic plate (Fig. 3).

5. A dot grid with the required number of dots was made from a second multilith plate (Fig. 4). The dots in the grid were center-punched so that the plotter arm would remain stable when the point was at each dot. A ⅛-inch hole was punched in the center of the template and an aluminum screw post, sawed off to a ⅛-inch length, inserted as a center post.

The various office materials used in constructing this device were selected for their workability and convenience; however, other materials might have served the purpose just as well.

Contructing the Dot Grid Guide

Specifications for the dot grid guide were determined by using the plotter. A large piece of paper was secured to the table top under the plotter, and a vertical orientation line drawn to coincide with photo table. The horizontal orientation line was drawn by aligning a steel straight edge on the base sheet with the horizontal center lines on the photo tables. Then, by causing the radial lines, as viewed through the instrument stereoscope, to cross at several locations along the vertical center line on the right photo table, the fixed position of this line was transferred to the base sheet using the plotter pencil. The location of the vertical center line on the left photo table is flexible depending on the photo air-base length (distance between photograph centers). For this reason a scale was provided at the top of the guide for air-base lengths ranging from 3.2 to 3.8 inches—the range for air base lengths on 9 x 9-inch photographs. Each mark on this scale represents a position of the vertical center line for the left-hand photo table when the plotter is adjusted for the corresponding air-base distance. The location of the horizontal center line was found by aligning the radial lines, as viewed through the instrument stereoscope, with the horizontal center lines on the photo tables and marking the position in two places on the base sheet with the plotter pencil. By connecting points marked on the base sheet, it was an easy matter to complete the specifications and construct the dot grid guide. Once constructed, the guide was attached to the plotter base with the slot in the guide coinciding with the slot in the base.

Orientation of the Plotter

Before being used, the plotting instrument was checked for proper adjustment following the procedure outlined by the manufacturer. Once this had been done, the following steps were taken to orient the plotter with the dot grid guide:

1. The horizontal axes of the photograph tables were lined up with the horizontal red line on the guide.

2. With the right triangle, the inside edge of the left photograph table was lined up with the vertical solid black line on the guide.

3. Horizontal orientation was rechecked and adjusted.

4. A stereoscopic pair of aerial photographs were oriented on the photograph tables in the manner outlined by the instrument manufacturer.

5. The dot grid to be used was fitted in place with the center post in the slot on the guide and with the top of the grid facing to the left. To plot dot locations for the top of the photo on the right table, the dot grid was placed in position at the right centerpoint on the guide. This point corresponds to the center of the right-hand photo in the stereo pair. When the dots were being plotted on the bottom of the left-hand photo in the stereo pair, the dot grid was placed in position with the fiducial mark opposite the mark on the air-base scale that corresponded to the average photo air base being used.

6. When properly oriented with the line of flight, the fiducial marks on the photographs will not always be lined up correctly with the center lines on the photo tables. Because of this, the dot grid was rotated an equal number of degrees from the horizontal center line so that the dots, when spotted on the photo, were aligned correctly with the photograph. In each case the dot grid was oriented with the photo on which the dots were to be located. After it was adjusted, the dot grid was secured in place with a piece of masking tape at one corner.

7. The dots were then transposed to their correct photographic location.

A Practical Test

Seven counties in the mountain region of Virginia and North Carolina were selected for a test of this method. Land-use classification was completed for each of the seven counties using the method described in this paper. The dot grid to be used was placed on the guide and each dot transposed in turn to the sample photographs (every third photograph in alternate flight lines) by moving the plotter arm to each location on the grid. By examining the dot locations on the stereo model at the intersection of radial lines, each was classified forest or nonforest and listed on a form for this purpose. The forest area in each county was then computed by multiplying the proportion of dots in forest times the total land area in the county.

For comparison, land-use classification was repeated for the seven counties using the same sample photographs but using transparent dot grids instead of the plotter method. These grids were constructed on acetate using the same outer dimensions and dot spacing as those used with the Radial Planimetric Plotter. Then, with the grid fastened to each sample photograph, a separate tally was made of the land-use at each dot location. Forest area was then recomputed

for each of the counties in the same manner as described above.

From a comparison of forest areas obtained using the two-methods, we found that in only one county was the forest area less when using the transparent dot grid, and this was probably the result of hilltop pasture land that is characteristic in this county. The total forest area for the seven counties was 2.3 percent, or 33,687 acres higher, when using the uncorrected transparent dot grid method.

One general conclusion that can be drawn from this test is that it would be a serious mistake to ignore the effect of relief displacement in mountainous areas. Where forest and nonforest land is intermingled and evenly distributed, there is good reason to believe that the time consumed in correcting for relief displacement would not be justified. On the other hand, where forest and nonforest conditions are located in bands, or strips, forest area will usually be on the ridges and nonforest land in the valleys. In this case the more laborious plotter technique would be justifiable to guard against overestimating forest area.

S.A.F. PRESIDENT E. L. Demmon introducing Dr. R. E. McArdle, chief of the U. S. Forest Service, who reported on the Timber Resource Review at the annual meeting of the Society in Portland, Ore., in October.

Reports of Committees, Divisions, and general Society business discussed at the annual meeting will be covered in the January issue of the JOURNAL. The talks and papers delivered at the general and divisional meetings will be carried in the Proceedings of the meeting, now in process of publication.

Notes

Preliminary Timber Resource Review Issued[1]

The nation's timber requirements are expected to be so high by the end of the century that timber growth will need to be from 70 to 120 percent greater than it now is.

Improved forest management at recent rates of progress appears unequal to providing a balance between cut and growth at the year 2000. This means that further acceleration in forest management and production on both public and private lands must be attained if anticipated demands are to be met.

These are two of the basic conclusions in the preliminary Timber Resource Review issued October 17 by the U. S. Department of Agriculture. In it facts are presented and those facts interpreted, but no program recommendations made.

The report required over three years in planning and field survey by the U. S. Forest Service in cooperation with state foresters, other state agencies, forest industries, and other public and private organizations. Cooperating agencies contributed half a million dollars in manpower equipment, and cash to aid in conducting the survey.

The report highlights the need for gearing activities to increases in population and to the level of economic activity assumed for the rest of this century. It credits expanded forestry efforts during the past 10 years with development of a sounder forest resource situation.

However, the report warns, major weak spots still exist in the lack of effective forestry on small private ownerships which contain more than half of all commercial forest land. Weak spots include existence of 115 million acres of unstocked or greatly understocked forest land, and tremendous timber losses still resulting from insects, disease, fire and other destructive agents.

"I think we can all take much satisfaction in the evidence as presented in the Timber Resource Review that, by and large, our timber situation isn't getting worse, and in some respects is getting better," said Richard E. McArdle, chief of the Forest Service, in commenting on the report.

"But whether the situation is getting better isn't too much to the point," he added. "We can't consider forestry in a vacuum. It isn't enough for the present forest trends to continue; we must consider those trends in relation to population and other things in the national economy that will influence future demands for timber.

"Overall comparison of current timber growth and cut are almost meaningless," it was explained, "because they obscure the important differences between softwoods and hardwoods and because they fail to reckon with the future relation of demands and growth.

"Whether there is time enough to gear up to levels of future demand by the end of the century, and still meet increasing needs in the meantime, is a pretty debatable question," Mr. McArdle said.

"If we accept the assumption that the population of the United States is going to keep on increasing at a rapid rate, and if we accept the estimates of potential timber demand at all seriously, it is going to require an intensification of forestry effort above and beyond what most of us have visualized," he said.

"I hope that this study will add to America's leadership in forestry," Mr. McArdle continued, "that it will be useful to other nations of the world in relating our timber situation to theirs, and that it will serve as a basis for long-range forestry planning for progressive forest industries and for state governments and the federal government.

"I believe the study will convince the reader that we are not faced with an acute timber shortage in the United States. I earnestly hope that it will also convince the reader that we face a tremendous challenge if we are to grow enough timber so that our children may enjoy the timber abundance that we ourselves have known."

Some of the highlights of the report are:

1. The United States now has 489 million acres capable of growing timber for commercial use. The survey indicated, however, there no longer appears to be an excess of forest land and any substantial reductions in the acreage of land devoted to timber crops may adversely affect future timber supplies.

2. Some 115 million acres, one-fourth of all the country's commercial forest land, is poorly stocked or nonstocked. About 50 million acres will require planting if it is to become productive within a reasonable time. The study shows that overall timber growth is increasing; on a national basis, saw-timber growth was nearly 9 percent more in 1952 than comparable growth in 1944. The review indicates that the quality of timber in the forests is declining.

3. Condition of recently cut-over lands was found generally to be best on lands owned by the forest industries and on public forest lands. Condition of such lands was poorest on farm and other private forest lands. Some 4½ million farm owners and other private nonindustry owners of timberland hold the key to the nation's timber supplies, the Review indicates. On the average their holdings are small; 85 percent of them own less than 100 acres of timberland each. But in the aggregate their holdings comprise 60 percent of the country's total commercial forest lands and supply a substantial part of the raw material for forest industries.

4. The Timber Resource Review shows that greatest loss in potential timber growth comes from insects, diseases, and fire. Each year these kill an amount of saw timber equal to one-fourth of the annual growth. Insects and diseases now outrank fire as damaging agents. Much progress has been made in prevention and control of fire; a similar reduction in the toll of insects and diseases would contribute substantially toward increased future timber supplies.

5. One-fourth of the timber cut is not now utilized, according to Review findings. Closer utilization of timber and reduction of unused plant and logging residues would help to make available supplies go farther.

[1] A summary of the Timber Resource Review was given by Forest Service Chief Richard E. McArdle on October 17 at the annual meeting of the S.A.F. in Portland, Ore. His talk, entitled "Timber Resources for America's Future," will appear in the Proceedings of that meeting.

This Note is essentially a quotation of the U. S. Department of Agriculture news release regarding the preliminary TRR.

6. The Review indicates that greatest possibilities for adding permanently to the nation's timber supplies lie in improving the stocking on the one-fourth of the commercial forest land that is poorly stocked; in obtaining sufficiently prompt and adequate restocking on cut-over areas so as to maintain their productivity; in realizing the 8 billion board feet a year growth potential of the 50 million plantable acres; and in reducing the loss due to insects, diseases, and fire.

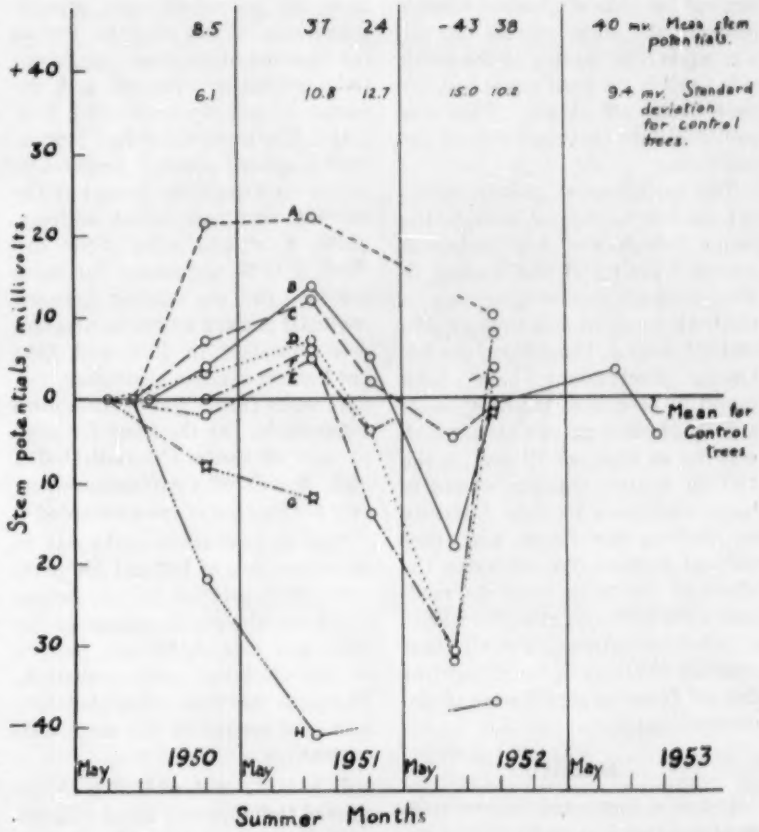
The present preliminary report is the latest of a series of periodic appraisals made at 8- to 10-year intervals. The last similar review of the forest situation, the Forest Reappraisal, was made in 1945.

Effect of Synthetic Growth Regulators on the Electrical Potentials of Red Pine Trees[1]

In 1942 and 1943, Snow (*4*) and Parr (*3*) published articles in this JOURNAL on the use of electrical potential measurements in connection with applications to certain forestry problems. In this same field a survey has been made of red pine trees (*Pinus resinosa* Ait.) in Canada sprayed with synthetic growth regulators and it seems probable that measurements of electrical potential may be of use to follow the effect of such chemicals on trees. The salient features of this recent survey may possibly be of interest.

In the spring of 1950 a number of trees were sprayed with synthetic growth regulators at sites near Angus, Ontario. It was not possible to take electrical potential measurements on the trees before they were sprayed, but the number of control trees made this unimportant. Instruments were prepared to take the first measurements in September, 1950. Each year thereafter two readings of potentials were taken, covering in all a period of four summers.

Three synthetic growth regulators were used in varying concentrations as spray for the trees.



A	2	trees	sprayed	with	100	ppm	2,4-D	at Borden	1	application.
B	6	"	"	"	100	"	"	" Craighurst	1	"
C	5	"	"	"	100	"	"	" Borden	2	"
D	2	"	"	"	200	"	"	" "	1	"
E	2	"	"	"	200	"	"	" "	2	"
F	3	"	"	"	200	"	"	" "	3	"
G	2	"	"	"	1,000	"	"	" "	1	"
H	3	"	"	"	10,000	"	"	" "	1	"

The upper electrode was usually positive to the base: polarities refer to the upper electrode.

FIG. 1.—Difference in mean electrical potential of 2,4-D sprayed trees and control trees.

These were: 2, 4—dichlorophenoxyacetic acid (2, 4—D); naphthalene acetic acid (NAA); and triiodobenzoic acid (TIBA).

Experimental Procedure

Nonpolarizing electrodes were used, made from pure silver covered with a film of chloride and were mounted in small glass and rubber medicine dropper pipettes in saline gel. The technique of preparing the gel and electrodes was that described by Burr (*1, 2*). A portable electronic Coleman potentiometer was used to measure the potentials.

Readings of potential were taken between the base of the tree and a point 150 cm. higher up, directly over it. In each case, the trunk was bored approximately to the cambium with a 5 mm. cork borer or small knife, and the electrode jell was made to touch gently the slippery surface of yellow woody tissue. Variations in stem readings seemed largely due to changes in position of the holes through the bark. For although the potential difference increases in proportion to the height up the trunk, it also changes (often critically) with the depth of cut into the tree and with the position on the trunk—being least on the shade side and greatest on the

[1]This work was made possible by a grant from the National Research Council of Canada, and by the assistance of Professors George H. Duff of the Department of Botany, University of Toronto, and B. W. Kelley of Waterloo College.

sun side or side of greatest branch growth. For these reasons the cut was made into the tree on the north side until it hit hard tissue and the core broke off evenly. This was probably into the wood side of the cambium.

The variations at present inherent in the technique include the meter (which was reproducible to within 1 mv.) and the changes in stem readings due to alteration in electrode position and time of contact (± 3 mv.). In addition the following fluctuations have been found to be due to the tree itself: a daily rhythm up the stem which may be as high as 30 mv. in the 150 cm. height, changes related to large variations in light intensity or wind on new tissue, and other natural cycles. To minimize the effect of the daily cycle the readings were taken on each site within a two hour interval, but all these complex rhythms in the living tree detract from the significance of single readings.

Results

Between forty and eighty trees were measured at each time of examination on two sites, Borden and Craighurst, 30 miles apart. Of these, twenty to thirty trees were used for control readings, the other trees having been sprayed with synthetic growth regulator. The mean potential reading has been calculated for each group of control trees and for each group which received a particular spray treatment. In order to minimize the effect of natural cycles on the readings, the differences between the mean readings of the treated and control trees taken at the same time have been plotted in Figure 1. Standard deviations, actual potential readings (means) and details of spraying are attached to the figure.

The most extensive spraying was done with 2,4-D in concentrations between 100 and 10,000 parts per million (ppm). Figure 1 indicates that a definite pattern was produced in the stem potentials as the concentration of spray was increased. At the lowest concentrations the potentials were greater than those of the controls, but as the concentration rose the potentials gradually dropped and reversal in polarity eventually took place. The trees which had concentrated sprays showed progressive needle curl until the foliage of the current year was killed entirely. These results with 2,4-D are thought to be significant for three reasons: (a) the relation between potential pattern and concentration was consistent in 1950 and 1951 but became random thereafter, (b) the results from different sites were comparable, (c) the *t*-test for comparison of mean (5) indicated a high degree of significance wherever the number of trees exceeded 4.

Naphthalene acetic acid spray in concentrations of 100 and 200 parts per million solution neither caused any gross observable change in the trees nor any significant pattern to the electrical stem potentials. The same was true for tri-iodobenzoic acid sprays of the same concentration.

It is quite evident that both improved techniques of measuring potentials and larger samples of trees are desirable for further studies. Nonetheless this survey has shown that at least one synthetic growth regulator 2,4-D, does effect the electrical potential of living red pine trees, and full measurements of treated and control trees would appear to determine the effectiveness of the spray.

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Sapwood Moisture Associated with Galleries of Dendroctonus valens

The red turpentine beetle (*Dendroctonus valens* Lec.) was suspected of being instrumental in the death of Jeffrey pines (*Pinus jeffreyi* Grev. and Balf.) in southern California in 1950. One of the effects on pines of attack by another species of this bark-beetle genus was demonstrated by Caird[1] to be the progressive drying of the aerial portions of the infested tree. If complete, drying results in the death of the tree, but in partial or sporadic beetle attacks only the infested part of the tree shows desiccation. A preliminary study of trees infested in the southern California outbreak shows that attacks by the red turpentine beetle reduced sapwood moisture and thus could have killed the trees.

Sapwood moisture was measured in the vicinity of the phloem galleries which had been excavated by the adult beetles. The attacks were at the ground line on the host trees. After the adjacent dirt had been removed, the galleries and surrounding sapwood were exposed by peeling off the bark. A 3/8-inch arch punch was used to collect sapwood samples 6 or 12 millimeters long. The longer samples were split into two 6-millimeter segments. Each sample was numbered and sealed in aluminum foil. Samples were collected in September 1950, and moisture determinations were made within 24 hours after the collection.

Moisture contents were determined in the laboratory. The samples were weighed; then they were dried at 100° C. in a forced draft oven until their weights were constant. Moisture content was expressed as a percent of the dry weight of the wood.

The moisture data showed a very pronounced drying of the sapwood directly beneath the adult beetle galleries. Representative sapwood

[1]Caird, R. W. Physiology of pines infested with bark beetles. Bot. Gaz. 96 (4):709-733, illus. 1935.

moistures in the vicinity of two typical galleries are shown in Figure 1. That drying was restricted tangentially is demonstrated by the higher moisture content of the sample between the two galleries. The moisture contents of the inner sapwood samples indicated that the drying extended radially inward more than 12 millimeters. Moisture determinations on larger samples made with a 2-inch arch punch showed that radial drying extended inward more than 30 millimeters.

The drying found in this investigation is comparable to that which Caird found beneath galleries of the southern pine beetle (*D. frontalis* Zimm.). Caird noted that the entrance holes and galleries of the beetles exposed the wood to air and fungi. He suggested that air accumulated in the wood, fungi penetrated the cells, conduction was disrupted, and drying followed. He showed that the wood became dry and lost its ability to conduct solutions progressively from the cambium to the heartwood of the tree. Similar processes probably caused the drying found in this study of red turpentine beetle galleries.

Physiologically, sapwood drying beneath red turpentine beetle galleries is of the utmost significance. The drying certainly would reduce the ability of infested trees to resist further attack, for it would impair their ability to produce oleoresin. Trees in which conduction was disrupted probably would be predisposed to attacks by other primary bark beetles. Keen,[2] in discussing the red turpentine beetle, states: "Ordinarily it is not considered an aggressive tree killer, but it does do considerable primary damage and so weakens trees as to make them more susceptible to attack by other bark beetles. In some infestations, as in Monterey pine in California, it causes sufficient damage to kill the tree." Certainly, where turpentine beetle galleries are so numerous as to encircle the stem and roots, sapwood drying could stop all conduction. Trees girdled in this manner would be desiccated rapidly and would die. Theoretically, desiccation and death of bark-beetle-infested trees should be most rapid under conditions of drought where the conduction system would be subjected to extreme stress.

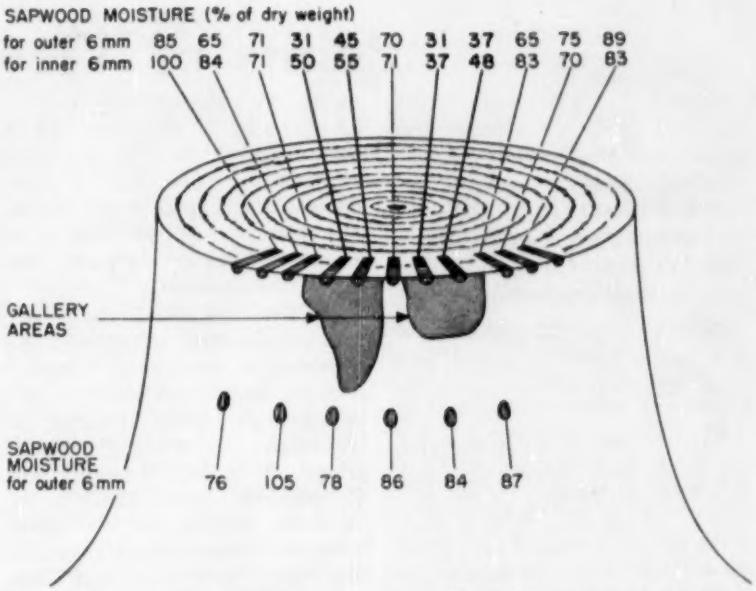
SAPWOOD MOISTURE (% of dry weight)
for outer 6 mm 85 65 71 31 45 70 31 37 65 75 89
for inner 6 mm 100 84 71 50 55 71 37 48 83 70 83
GALLERY AREAS
SAPWOOD MOISTURE for outer 6 mm
76 105 78 86 84 87

FIG. 1.—Representative sapwood moisture in the vicinity of two typical galleries of the red turpentine beetle.

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[2]Keen, F. P. Insect enemies of western forests. U. S. Dept. Agric. Misc. Publ. 273 revised, 280 pp., illus. 1952.

Points of View

Comments on "Some Effects of Burning on Forest Soils of Western Oregon and Washington"

There were several points raised in a recent paper by Austin and Baisinger[1] which deserve some comment.

One of these is the preoccupation in one part of the paper with the effects of burning on the surface ½" of the soil. Much is made of the fact that changes have taken place there, with the implication that poor seedling survival and growth will be the result. However, the seedling roots would very quickly get below this layer and the surface 3-6" might be much more important. The only data presented which might be pertinent to this question are those for the surface 2" and no large changes are evident in this layer. Furthermore, no indication of variability is given to indicate whether the differences observed may be significant.

In discussing the effect of the fire on the soil, much emphasis is placed on the effect of the fire on the moisture holding capacity (moisture equivalent) of the soil. This measurement alone is quite irrelevant to the question of seedling survival. The difference between the moisture equivalent and the permanent wilting percentage, in other words the available water, is the important thing here. It is misleading to imply that reduction in the moisture equivalent alone would result in poorer chances for seedling survival.

Some comment is made in the paper on the release of nutrients by the fire with the statement that this release has resulted in an imbalance of nutrients. However, do the results indicate an imbalance? No evidence is presented to prove that this is so, and no amount of quotation from an "expert" can change the situation.

In Tables 3 and 4 in the paper, data are presented to indicate that no potassium, calcium, or "active" nitrogen could be detected in soils in "problem" areas. However, no indication of the depth of soil sampling is given. Was the entire profile sampled? It is difficult to believe the implication that these elements are not present anywhere in the profile. Some clarification is in order here.

It seems to me that the defects noted seriously detract from what might have been an informative paper.

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Professor Ferrell's comments are interesting since some of them reflect views widely held by soils men. In regard to the four points he mentions:

1. As Prof. Ferrell says, seedling roots quickly penetrate below the surface layer. They can do so only, however, if they survive long enough. The most critical period is the one immediately after germination and the soil microsite, as far as the germinating seedling is concerned, is the surface layer.

2. "Available" water is, of course, the crucial item. Precisely what water is available and how easily available is by no means a matter of complete agreement. In some soils, particularly fine textured soils, permanent plant injury can result from levels much above the permanent wilting point. Changes in moisture equivalent reflect relative changes in the amount of water available to the seedling and that is as far as we can factually go since the difference between moisture equivalent and permanent wilting percentage may or may not be "the important thing here."

3. At this time there is no precise information available (unless Professor Ferrell has it) indicating exactly what a balanced nutrient supply in forest soils supporting the species in question should be, so we have felt that an evaluation of the nutrients in a normal unburned area adjacent to the burned plots would constitute a fair measure of a balanced condition and any extreme departure from this could be considered unbalanced.

4. As indicated, the nutrient elements were determined by the Spurway quick-test method, (and we fully realize the shortcomings of this method). Anyone familiar with the test will realize that zero values simply indicate the lower limit of sensitivity of the tests. Complete absence of these elements was not implied even though they are present in extremely small amounts in the "active" form. In the interest of brevity detailed descriptions of the standard Spurway tests were not considered necessary and we hope that this point has not confused others who may have read the article.

Our paper was not intended to be a definitive work, but, as stated, only to show "general effects of the amount of disturbance from the normal that might reasonably be expected whenever forest soil is subjected to moderate or severe burning."

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[1]Austin, R. C. and D. H. Baisinger. Some effects of burning on forest soils of western Oregon and Washington. Jour. Forestry 53: 275-280. 1955.

Reviews

Our Soils and Their Management

By Roy L. Donahue. 446 pp. Illus. The Interstate Printers and Publishers, Danville, Ill. 1955. $3.75.

Intended for use in vocational agriculture instruction at the high school and subprofessional level, this book is not a collegiate-type text in content or format, nor is it a land manager's handbook, but more of a happy medium between the two extremes. The reader is assumed to have a farm background and experience in general agricultural problems, practices, and terminology.

There are two main parts to the volume. The first covers the basic principles of soil management and includes land judging, water management, soil erosion, soil testing, fertilizers and their use, and organic matter. The balance of the material includes seven special problem-solving "how to manage" chapters including pasture soils, garden soils, lawn soils, orchard soils, range soils, forest soils, and special management problems.

The author has incorporated a wealth of valuable information for the guidance of practical land managers. He has drawn heavily on his personal experience in many parts of the country. There are many very good illustrations and diagrams, and frequent reference is made to research literature.

Unfortunately, the book lacks continuity and organization of material for good reader interest. The inclusion of six different schemes for judging land covering 40 pages in the second chapter is more confusing than helpful.

Some figures are reproduced without change from other sources on too small a scale. For example, the map of the great soil groups is not legible without a magnifying glass. The verbatim insertion of extension releases and talks introduces a nonuniformity of style and level of material which is disturbing.

The chapter on "How to Manage Forest Soils," which would be of particular interest to forest managers, is based mainly on research done in New York. Some of the author's silvicultural recommendations, particularly with respect to "soil building" and "soil depleting" species lack a firm basis. Considerable attention is given to a relatively minor piece of research on the soil-improving abilities of white birch, whereas the really significant contributions of S. A. Wilde and Philip Wakeley in the field of nursery management have been completely ignored.

This work will probably be widely used in the area of instruction for which it was primarily intended—vocational agriculture.

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Forestry Handbook

Edited for the Society of American Foresters by Reginald D. Forbes and Arthur B. Meyer. 1212 pp. Illus. Ronald Press Company, New York, N. Y. 1955. $15.

A reference book of facts, working methods, and useful data in all branches of applied forestry and related fields, the *Forestry Handbook* contains more than 1200 pages organized into 23 indexed sections. In this one convenient volume have been compiled the fundamental techniques of forestry practice in the United States and Canada.

Designed for the use of professional workers and technicians, the *Handbook* presents in easily accessible form the formulae, tables, converting factors, and related data most generally employed in the management of forests and allied resources. The related specializations, to each of which a separate section has been devoted, are range management, recreation, watershed management, and wildlife management.

Other sections are devoted to such basic subject matter fields as aerial photography; chemical and physical tables and definitions; chemistry and physics of wood; communications; economics and finance; fire; geology and soils; insects and diseases; logging; materials, structures and facilities; mathematical formulas and definitions; measurements; road engineering; silvics and silviculture; surveying; utilization and wood technology; volume tables; yield tables and stocking.

An editorial board of 145 consulting and contributing editors—drawn from industry, government, universities, and experiment stations in all the major forest regions of North America—selected the tremendous volume of data that comprise the book. There are some 400 tables and nearly 300 charts, graphs, drawings, and photographs.

It was the intention of the compilers that this book would serve two purposes. First, it would put at the command of the technician the essential facts and information necessary to the practice of his special field. Secondly, it would provide him with techniques and data useful in the solution of problems outside his immediate experience or training.

Although the book is intended to help the resource manager solve day-to-day technical and administrative problems, it should be useful also in long-range policy formation. Students preparing for careers in forestry and related professions, and educators charged with their training, will find the *Handbook* both a helpful reference work and a teaching aid.

The book is compact, clearly printed, and bound in a soft flexible cover.

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Climates in Miniature

T. Bedford Franklin. 137 pp. Illus. Philosophical Library, New York, 1955. $3.75.

Some people claim to have found the joy of life in wine, women, and song. Others search for happy moments in horses, hounds, and hares, or other fascinating modes of leisure. None of these, however, captured the attention of the author of the reviewed treatise. In the days of his tender youth he was seized by a passion for a simple instrument—the thermometer. Rain or shine, at midday and during the small hours of the night, he was drawn by his "magnificent obsession" to record the level of mercury in garden beds, compost piles, and rabbit burrows. In time the infatuation of school days deepened into a life-long bond which brought into existence the *Climates in Miniature*. As may be expected, this work is written in warm, entertaining language which at times borders on literary achievement. The introductory paragraph of the account "What happens to the rain" is representative:

"Change is the spice of life. Yesterday, after several days' fine sunny weather, the surface thermometer was in the 90's, the two-inch dry mulch looked grey and tired, the evaporimeter was working furiously, the plants were wilting, and I could imagine the bacteria down below saying that it was a long time between drinks. To-day it is raining, the thermometer does not move, the evaporimeter is asleep, the mulch has gone and the soil is brown and shining, and I am sure the bacteria are working all the better for their drink. I can almost hear them chuckling because the rain has gone to the old man's head; perhaps they are right, for there is something extremely satisfying in watching much-needed rain refresh a garden."

Most of the 15 chapters of the book deal with the writer's first hand observations of micro-climatic conditions in refuges of hibernating rodents, hedgerows, coppice, garden plants and soils that support them, and even bushes providing roosts for blackbirds. To strengthen his thesis the author quotes experiences from elsewhere, e.g., the research of USDA climatologists on cranberry marshes of Wisconsin. One chapter is concerned with micro-climate in the home and offers suggestions in regard to the construction and maintenance of houses. Coming from a man reared in the Scottish climate, such suggestions cannot be anything but valuable, or, more specifically, money saving.

Although the book includes but a few incidental observations directly relevant to the forest or forest soils, it has an immense indirect importance for silviculturists. Its author demonstrated on concrete examples the decisive effect of local climatic conditions upon the dynamics of organisms. Using simple instruments, he elevated the empirical knowledge or "hunches" of a farmer to the exacting information of a scientist, and he found by means of his experimental techniques better ways to grow plants and animals. To profit from the account of these experiences, the forester must visualize beyond Franklin's hedges, bushes, and ditches the milieu of forest stands in the process of natural regeneration. Then he may be able to perceive new horizons on which the vision of the empirical *art* of timber growing will be eclipsed by the ascending image of silvicultural *science*.

Climates in Miniature, written by a man who has no connection with forestry and claims no academic status, is more significant for silvicultural thought and practice than are many forestry texts.

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Propagation of Horticultural Plants

By Guy W. Adriance and Fred R. Brison. 2nd ed. 298 pp. Illus. McGraw-Hill Book Company, Inc., New York. 1955. $6.50.

This revised edition of a popular textbook will be welcomed by teachers of introductory courses in horticulture. A brief history of horticulture and its development is followed by chapters on plant structures and plant-growing equipment.

The major portion of the book is devoted to a generalized survey of propagation methods by seedage, layerage, cuttage, graftage, and by bulbs and other modified structures. Final chapters are concerned with problems associated with the propagation of important groups of fruit plants, and the function of transplanting and pruning.

The text is well illustrated by numerous halftones of good quality. The indexing is satisfactory.

The book is not designed for use as a reference and for this reason is of doubtful usefulness to foresters except those who may be interested in obtaining a general introductory acquaintance with the plant propagation field.

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Outdoor Hazards—Real and Fancied

By Mary V. Hood. 242 pp. Illus. Macmillan Company, New York, N. Y. 1955. $3.95.

Outdoor hazards have been discussed almost without exception as logical chapters in books on outdoor living from Nessmuk's 1884 classic *Woodcraft* through Kephart's 191 encyclopedic *Camping and Woodcraft* to the Sierra Club's 1951 *Going Light with Backpack and Burro*. World War II survival books such as Graham's and O'Roke's *On Your Own* and the Navy's *How to Survive on Land or Sea* accent avoidance of outdoor disaster importantly.

Thus for decades men have dispelled fears of outdoor catastrophe as a means to the end of enjoyable outdoor living, working, and travel. Hence a book discussing outdoor hazards primarily achieves a specialization unique among outdoor books.

Perhaps realizing this means-end relationship, Mrs. Hood concludes her book with several chapters up-

on camping. But, having already written at length about hazards, she refers the reader desiring more detail about camping to numerous other books with a glibness which may appall those not accustomed to securing references quickly needed.

A sensitive few may prefer reading of outdoor hazards within regular camping books, wherein they are incidental. To such readers an entire book upon hazards marshalls an array of worries suggestive of Halloween horror shows.

Though her universe quite obviously centers in California and Yosemite, Mrs. Hood covers the nation's outdoor hazards with an impressive classification and discussion of mammals, birds, four-footed reptiles, snakes, amphibians, spiders and their relatives, creatures with many legs, insects, sea life, plants, the elements, and contaminated water. Up-to-date directions are given for avoidance as well as cures. Many myths are exposed. Some of the latest techniques—such as cryotherapy for snake bite—are included. Advanced outdoorsmen find the book a delightful review. To beginners it reveals new vistas.

The book entertains and instructs in the manner that Mrs. Hood and others have found essential in dealing with national park visitors—neither boring the genius nor ignoring the moron. The author possesses talent for stringing words together to form verbal handles for branding, or damning, objectionable practices: "b e a r-feeding spectacles," "man, as this world's archpredator," "Sunday supplements . . . lurid and not always strictly accurate sheets." She deals adequately with anthropomorphism without employing that awesome word.

Foresters, despairing of teaching the dynamics of ecology to forest visitors, will admire the deftness with which this book presents problems of natural history, animal distribution and behavior, and necessary taxonomy. It teaches anew the fact that outdoor recreation areas are limited in extent, freshness, and activities one may practice upon them. However, foresters question the judgment of porcupines which Mrs. Hood credits with preserving our trees by consuming mistletoe and being ". . . natural pruners of the forest." Some will regret that she omits recent findings about the pits of pit vipers being heat sensory organs. Many advanced outdoorsmen will consult less entertaining sources of information concerning local hazards they front. Yet, considering the reading audience for which the book is chiefly written, it is a creditable job.

Detailed indexes and lists of reference books aid those who wish to learn more. It is a good book to recommend to others who want to read about outdoor hazards, whether their desire results from instinctive interest, a search for amusement, or contemplated preparation for outdoor living and travel.

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The Forester on the Job

By Walter F. McCulloch. 157 pp. Litho. O.S.C. Cooperative Association, Corvallis, Ore. 1955. $2.35 plus 12 cents postage.

First published by Oregon State College in 1950, this eminently practical, yet inspirational, handbook is the work of the well-known dean of the School of Forestry at that institution. It has been almost completely rewritten.

Designed for the use of the young forester, it tells him how to supervise others and how to get along with people. As these are two of the most important jobs he will have to do throughout his entire professional career, any book that will help him succeed is literally beyond value. Thus $2.47 is a modest enough amount to invest in success.

Chapter titles include supervision in forestry, developing supervisory ability, leadership, motivation, communication, building good job relations, applying job relations, rating employees, development of subordinates, training, personnel problems, accident prevention, job planning, and work improvement. In addition, there is a helpful list of references.

I wish I had had this handy volume thirty-five years ago. It would have saved my making a wholly unnecessary blunder on my first supervisory job. Although the wise man learns by the mistakes of himself and others, it is better not to make them in the first place.

As a guide to good human relations in forestry, this is positively the best and most useful work I have ever encountered. Accordingly, I have no hesitation in recommending it highly.

HENRY CLEPPER

Publications of Interest

The revised bulletin *Careers in Forestry* has recently been issued by the U. S. Forest Service. It deals primarily with careers in technical forestry, covering forestry as a profession, describing the character of the work and how it varies between various fields of employment, discussing the requisites for success and the prospects of a forestry career in the future. A well prepared bulletin for young men considering this profession. U. S. Department of Agriculture Pub. No. 249, for sale at 15 cents from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

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The 1956 edition of *Forest Products Research Guide,* published by the National Lumber Manufacturers Assn., is now available at $15 per copy from that organization, 1319 18th. St., N.W., Washington 6, D. C. More than 24,000 research projects of nearly 1,700 U. S. organizations and some 2,000 foreign agencies are identified. The number of projects reported in this edition exceed by 40 percent the number reported in the last, 1952, edition. The number of organizations identified with forest products research is also up—by 25 percent. Soviet Russia is reported as keeping pace with other countries in her research on forest products. The 394-page directory is published principally for the benefit of research laboratories, manufacturers, educators, students, and libraries.

Current Literature

Compiled by MARTHA MEELIG, *Librarian, State University of New York College of Forestry*
Range Management Section Compiled by FRANCIS FLICK, *Library, U. S. Department of Agriculture*

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Society Affairs

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College of Forestry
Syracuse 10, N. Y.

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RUTHFORD H. WESTVELD
Department of Forestry
University of Missouri
Columbia, Mo.

The President's Column

E. L. DEMMON

During the last two years I have assumed the responsibility of preparing a column for the JOURNAL each month, where I have visited with the members on a variety of topics having to do with advancing the profession of forestry. I have enjoyed this opportunity of presenting my ideas on ways and means of improving the Society. It has not always been easy to come up with something new each month for these columns, so some of the topics may have become somewhat shopworn. However, I have from time to time reminded the members of the objectives of our Society, where we stand on finances and membership, our professional obligations and responsibilities, opportunities for contributions in various forestry fields, and in general, my feelings on how the Society can become of greater use and value to its members and to the public.

Some of these columns have stimulated comments, usually favorable. I hope, however, that they have served in a small way to let the members know of their President's interest in advancing our profession. If the columns have accomplished this even to a limited extent, they will have served a useful purpose. In their preparation I, too, have profited by coming to closer grips with our Society's aims and objectives. Let me commend the idea to your new President, who will soon be assuming office for the next two years.

Our profession has continued to grow in membership and I hope in public esteem during the last two years. Our Chapters and Sections have generally been active and have conducted Society affairs in a professional way. I commend all the officers and committeemen as well as your industrious Council and Washington office staff for their efforts to advance and benefit our profession. But with all this good work, there is still plenty to do to enhance our status as a profession in the public eye.

I have enjoyed the opportunity of serving as your President the last two years and of visiting with you each month through these columns. Over the years it has been my pleasure and privilege to serve the Society at various times, having come up through the ranks of Section chairman, Council member for 4 years, and as your Vice President and President during the past 4 years. I am now ready to turn over the reins to my successor and to concentrate on my regular job with the Forest Service. Also, I hope to have sufficient leisure at home to get my garden back into shape, to again work on my foreign stamp collection (all donations gratefully received), and to enjoy the comforts of home life. Finally, should the Society have further need of my services at any time, I will gladly make myself available. However, it seems best to bring younger men into Society affairs, since on their shoulders will rest the future of our organization and the progress of American forestry.

E. L. Demmon

Dues Deductible

In filing U. S. income tax reports, all members may classify dues paid to the Society of American Foresters as deductible expense.

Coming Events

Southeastern Section Meeting

The winter meeting of the Southeastern Section will be held January 20-21, 1956 at the Whitney Hotel, Montgomery, Ala.

Ohio Forestry Association

The 53rd Annual Meeting will be held January 27-28, 1956 at the Southern Hotel, Columbus, Ohio.

Allegheny Section Meeting

The winter meeting of the Allegheny Section will be held February 10-11, 1956 at the Bellevue-Stratford Hotel, Philadelphia, Pa.

21st North American Wildlife Conference

The 21st North American Wildlife Conference will be held March 5-7, 1956 at the Jung Hotel, New Orleans, La.

When writing the advertisers mention the JOURNAL OF FORESTRY

Inactive Status

Society members temporarily serving in the armed forces may request that they be placed on inactive status.

Other Society members may request inactive status because of financial stringency or for personal reasons, provided such requests have the approval of a Section.

Inactive members do not receive copies of the JOURNAL OF FORESTRY, nor are they permitted to vote. They are considered as members of the Society and may be restored to active status upon request, with the payment of current dues.

Retired Status

Members and Fellows who retire from active forestry practice after having been members of the Society for 20 years or more may, upon application to the Council, continue as voting members, but have their dues remitted except for an annual charge of $5 should they desire to receive the JOURNAL OF FORESTRY and other Society publications.

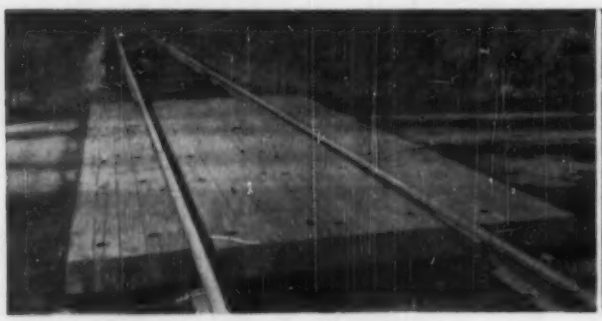
Retirement from "active forestry practice," as provided in Article V, Section 4, of the Society's Constitution, shall be interpreted as applying to members retired from full-time employment, either in forestry or other fields, with consequent substantial reduction in the income of the members concerned.

Members granted retired status in the Society must continue to pay Section dues in order to continue as Section members.

West Virginia Chapter, Allegheny Section, Holds Meeting

Fifty members of the West Virginia Chapter, Allegheny Section, Society of American Foresters gathered at Camp Caesar September 22-24 for the annual summer meeting. Don Hollen, chapter chairman and forester for Monongahela Power Company, Fairmont, opened the meeting and announced the theme of the program as "Opportunities for New Wood Using Industries for West Virginia."

The meeting began with registration



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September 22 and an address after evening dinner by Ray Parrott of the Arthur D. Little Company, Boston, Massachusetts, using the above theme. On Friday, September 23 a morning panel was led by J. M. Crafton, president of Chipcraft Corporation, Morristown, Tennessee; Henry Brown, Fairmont, W. Va., of the Charcoal Corporation of America; George Smallridge of Bartow, West Virginia; Edward Maties, Cairo, W. Va. Timber Products, Inc.; and Phil Berthy, extension forester, representing the West Virginia Christmas Tree Growers Association.

Friday afternoon the foresters inspected the new all electric sawmill of the Pardee & Curtain Lumber Company at Bergoo. Friday evening four students from West Virginia University School of Forestry discussed the "outlook for forestry students." Guest speaker after the banquet was D. B. Frampton, president of D. B. Frampton Company and Baker Wood Preserving Company, Columbus, Ohio who discussed "Utilization of Our Available Timber."

Business meeting of the Chapter was conducted Saturday morning. Program chairman was Howard Bennett, forester for Appalachian Hardwood Manufacturers, Cincinnati, Ohio. Henry Sipe, publicity chairman, reports an excellent meeting.

New York Section Holds Summer Meeting

With headquarters at the Colgate Inn, Hamilton, 104 foresters and friends spent two days, Sept. 8 and 9, on a tour of plantations in the Sherbourne-Norwich area. In these plantations the group was shown the results of several types of management which had been carried on; or where no management had been practiced with the resultant stagnation. District forester Chas. E. Baker as chairman of the summer meeting program committee did a commendable job in collecting and presenting growth and stand data which he and his able foresters, Wm. Craig and Victor Glider, presented at the different stops. The first day was spent viewing stands of plantation red pine on the Sherbourne watershed and Madison State Forest No. 1 in the Brookfield area. Lunch was served at the observation tower site on the State Forest. In the afternoon several other red pine sites and a hardwood site were visited with a return to the tower at 4 p.m. for the business meeting. Much interest was in evidence at the business meeting over such items as correction camps on state forests and progress of the Milmoe Committee in relation to the detached parcels of the Forest Preserve.

Following the banquet, served at the Colgate Inn, Larry W. Hamilton capably acting as toastmaster introduced several guests among whom were Senator Wheeler Milmoe, Assemblywoman Janet H. Gordon, Conservation Secretary John F. Daley, former Director Arthur S. Hopkins and our chairman, A. W. Bratton. Prof. Gene Adams of Colgate University gave an unusual talk entitled "Mental Telepathy—Fiction or Fact."

The second day of the meeting included a stop at the Norwich watershed in a stand of 43-year-old spruce which was in need of silvicultural work and a stop on Chenango State Forest No. 11 in a mixed stand of larch and Norway spruce in which both species were responding favorably to thinning.

An interesting comparison of "the early days" with today's forestry in New York State was sketched by George L. Barrus, Rochester, who worked with the Conservation Depart-

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W. R. Brown (1875-1955)

William Robinson Brown, 80, leader in New Hampshire forestry circles for half a century, died on July 7 at his home, in Dublin, N. H.

He was a member of the original New Hampshire Forestry Commission, formed in 1909, and its chairman for most of the 43 years he served.

As woods manager of the Brown Company to which he came in 1897 after his graduation from Williams College, he hired one of the first professional foresters ever employed by a lumber and pulp mill in America.

A history of forestry in New Hampshire and New England on which he had been working since his retirement from the Brown Company in 1944 is in the hands of publishers. He was a director of the Society for the Protection of New Hampshire Forests; was a director of the American Forestry Association for many years; and an Associate Member of the Society of American Foresters.

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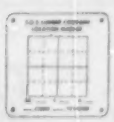
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ment under the direction of Clifford Pettis from 1910-1915.

On returning to Norwich where the entourage disbanded, a radio broadcast of the highlights of the meeting was aired with Charles E. Baker and Secretary John Barrett being interviewed over station WCHN from Norwich.

Thus ended a summer meeting which by the size of the attendance demonstrated a trend of interest and the growing need of more information and know-how of the mechanics of plantation management.

Central States Section Holds Annual Meeting

About 75 foresters from Indiana, Ohio, and Illinois attended the annual meeting of the Central States Section, Society of American Foresters, held October 6-7 in Jasper, Indiana.

Vice Chairman Robert Merz, Central States Forest Experiment Station, Columbus, Ohio, advanced to chairman of the Section for 1956. C. S. Walters, University of Illinois Agricultural Experiment Station, Urbana, was elected vice chairman. A. N. Liming, Indiana district extension forester, Versailles, was elected secretary-treasurer for a two-year period.

The meeting's theme was "The Management and Use of Low-Grade Hardwoods." Tours of Jasper wood-using industries and a report by Dr. J. C. Callahan, Purdue University, on hardwood management research under way on Purdue's southern research farm, supported the theme. Keith Hutchinson, Central States Forest Experiment Station, discussed a survey of Indiana's forest lands. Program Chairman E. R. Martell, Purdue University, also served as master of ceremonies at the evening banquet, where Dr. E. G. Locke, U. S. Forest Products Laboratory, spoke on new developments in the pulp and paper field.

E. L. Demmon, U. S. Forest Service, Asheville, North Carolina, the Society's national president, attended the meeting and spoke on Society affairs.

Charter members Burr Prentice, Purdue University, and L. J. "Brig" Young, University of Michigan, were among those attending.

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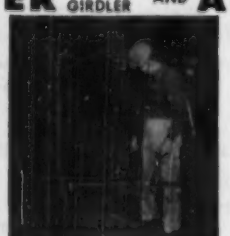
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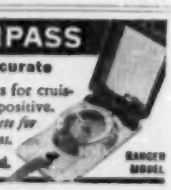
RANGER MODEL

SCHOOL BOX SCORE[1] 1955 MEMBERSHIP

School	Student applications received Dec. 1955	Total 1954	Total 1955
Alabama Polytechnic Institute	7	25	18
University of California	0	11	17
Colorado A & M College	4	18	9
Duke University	1	13	3
University of Florida	10	8	17
University of Georgia	14	35	28
University of Idaho	0	29	4
Iowa State College	7	21	22
Louisiana Polytechnic Institute	0	0	13
Louisiana State University	13	14	43
University of Maine	0	20	12
University of Massachusetts	6	12	11
Michigan State University	4	43	14
University of Michigan	7	28	21
University of Minnesota	8	23	19
University of Missouri	23	14	26
Montana State University	4	19	25
State University of New York	0	22	23
North Carolina State College	22	39	22
Oregon State College	19	18	38
Pennsylvania State University	0	37	32
Purdue University	20	26	24
Utah State Agricultural College	0	9	12
University of Washington	5	35	28
West Virginia University	20	22	26
Yale University	0	4	16
Totals	194	545	523

[1]Adjusted to new record year—now calendar-year basis.

SECTION BOX SCORE[1] 1955 MEMBERSHIP

Section	Applications received[2] Dec. 1955	Total 1954	Total 1955
Allegheny	20	72	63
Appalachian	26	69	38
Central Rocky Mountain	4	26	12
Central States	24	115	44
Columbia River	27	57	100
Gulf States	15	63	107
Inland Empire	1	40	10
Intermountain	0	15	18
Kentucky-Tennessee	1	5	9
New England	8	54	50
New York	0	39	33
Northern California	1	24	33
Northern Rocky Mountain	6	34	44
Ozark	25	42	47
Puget Sound	12	69	65
Southeastern	34	130	85
Southern California	0	2	3
Southwestern	1	7	12
Upper-Mississippi Valley	17	55	51
Washington	0	8	2
Wisconsin-Michigan	13	13	40
Totals	235	939	866

[1]Adjusted to new record year—now calendar-year basis.

[2]Student, Junior, Affiliate, Associate (Initial) grades only.

Kentucky-Tennessee Section Officers Announced

Robert F. Collins, supervisor of the Cumberland National Forest, Winchester, Kentucky, was recently elected vice chairman of the Kentucky-Tennessee Section. Bob will be installed at the annual meeting of the Section, December 2-3, 1955, when it is held at Mammoth Cave, Kentucky. Charles R. Page, Jr., consulting forester, of Chattanooga, is presently chairman and John W. Lehman is vice chairman. At the winter meeting, Lehman will advance to chairman, and Collins will be the new vice chairman.

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Membership Applications and Advancements

Proposals for admission, advancement, and reinstatements received in the Society office during the month of October are listed below.

Action on the eligibility of those proposed for membership as listed below will be taken by the Council as of January 1, 1956. Communications from voting members regarding the membership eligibility of these persons should be received in the Society office prior to that date.

Allegheny Section

Student Grade

WEST VIRGINIA UNIVERSITY

Baker, J. K.
Bond, D. L.
Foley, W. P.
Garrett, W. T.
Hayfield, W. E.
Headlee, T. M.
Laneve, A. P.
LaRue, G. M.
McQuown, R. C.
Medvick, C.
O'Brien, D. E.
Obye, R. J.
Peters, G. J.
Petruccelli, M. E.
Pickens, R. W.
Reed, R. T.
Shults, D. R.
Weaver, W. K.
Webb, E. L.
West, J. L.

Appalachian Section

Student Grade

DUKE UNIVERSITY

Post, B. W

NORTH CAROLINA STATE COLLEGE

Adams, S. M.
Asher, W. C.
Boulogne, P. M.
Butler, G. L.
Curtis, W. R.
Dowless, V. G.
Emory, J. B.
Green, G. G.
Hudson, S. T.
Jones, D. C.
Kelley, J. S.
Lee, J. M.
Norton, C. E.
Norwood, R. G.
Parker, J. R.
Pi kenheim, P. J.
Stevens, W. B.
Stevenson, J. C.
Taylor, R. P.
Taylor, S. A.
White, M. J.
Wood, T. D.

Junior Grade

Brown, W. L., Forester, S. C. State Com. of Forestry, Walterboro, S. C. Reinstatement.
Bryan, W. J., Forester, U.S.F.S., Franklin, N. C. Reinstatement.
Huxster, W. T., Trainee, International Paper Co., Georgetown, S. C.; N. C. State, B.S.F., 1955.
Lares, J. W., Dist. Ranger, U.S.F.S., Highlands, N. C.; Pa. State, B.S.F., 1940.

Affiliate Grade

Weaver, S. W., Asst. Dist. Ranger, U.S.F.S., Robbinsville, N. C.; Okla. A & M, B.S. (Forestry), 1950.

Central Rocky Mountain Section

Student Grade

COLORADO A & M COLLEGE

Baer, R. G.
LaBau, V. J.
Linn, H. S. B.
Smedley, F. P.

Central States Section

Student Grade

PURDUE UNIVERSITY

Balka, B. C.
Burke, R. D.
Grube, P. B.
Hartke, M. E.
Harvey, J. F.
Hebert, D. G.
Hoses, W. H.
Jones, T. A.
Kerr, R. L.
Law, J. R.
Lee, R. P.
Lennertz, F. A.
Mitchell, W. R.
Osterhage, L. J.
Pryor, J. P.
Raetzman, M. E.
Rich, J. L.
Selby, K. C.
Vogel, J. A.
Wagner, W. J.

Junior Grade

Costello, J. T., Farm Forester, Dept. of Cons., Sparta, Ill.; Purdue, B.S.F., 1952.
Degroot, D., Supv., Republic Creosoting Co., Indianapolis, Ind.; Purdue, B.S.F., 1947.
Miller, R. S., Park Supv., Bureau of Parks, Dayton, Ohio; Purdue, B.S.F., 1942.

Associate Grade

Kern, R. E., Route 1, Rochester, Ind.

Columbia River Section

Student Grade

OREGON STATE COLLEGE

Ballew, L. E.
Carter, R. B.
Christiansen, D. R.
Cobo, E. T.
Davies, W. G.
Ertel, R. L.
Hamilton, C. W.
Hoyt, J. V.
Johnson, R. O.
Madison, R. W.
Mitchell, R. G.
Page, P. E.
Reed, J. H.
Sikora, C. V.
Sipe, R. L.
Swanson, C. L.
Toney, R. D.
Tutt, R. C.
Woodard, L. L.

Junior Grade

Anderson, M. J., Forester, Tree Farm Mgmt. Service, Eugene, Ore.; Ore. State, B.S.F., 1950.
Dose, J. C., Forester, Bur. of Land Mgmt., Coos Bay, Ore.; Iowa State, B.S.F., 1952.
Hanneman, E. D., Forester, State Board of Forestry, Salem, Ore., Ore. State, B.S.F., 1947.
Higginson, G. R., Forester, Bur. of Land Mgmt., Eugene, Ore.; Univ. of Calif., B.S.F., 1949.
Oard, A. G., Dist. Ranger, U.S.F.S., Prairie City, Ore; Ore State, B.S.F., 1947.
Smeltzer, D. A., Forester, Bur. of Land Mgmt., Medford, Ore.; Purdue, B.S.F., 1950.

Member Grade

Griffith, G. C., Forester, Pope & Talbot Inc., Glenbrook, Ore. Reinstatement.

Affiliate Grade

Peterson, H. W., Supt., Crown Zellerbach Corp., Molalla, Ore.

Associate Grade

Williams, C., Photogrammetric Eng., Bur. of Land Mgmt., Portland, Ore.

Gulf States Section

Student Grade

LOUISIANA STATE UNIVERSITY

Barnett, J. P.
Bond, B. C.
Box, B. H.
Brinkman, G. L.
Broom, E. D.
Elliott, H. E.
Herker, G. C.
Lizana, H. P.
Rosentreter, G. C.
Schwartz, M. M.
Sellars, C. H.
Smith, W. J.
Watkins, J. T.

Junior Grade

Hansbrough, T., Asst. Forester, North La. Hill Farm Expt. Sta., Homer, La.; L.S.U., B.S.F., 1949.
Wasson, G. W., Area Forester, Gaylord Container Corp., Pearl River, La., L.S.U., B.S.F., 1950.

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Inland Empire Section

Junior Grade

Deward, C. J., Forester, Potlatch Forests, Inc., Lewiston, Idaho; Utah State Agric., B.S.F., 1951.

Intermountain Section

Member Grade

Sevy, J. L., Kemmerer, Wyoming. Reinstatement.

Kentucky-Tennessee Section

Junior Grade

Scott, D. F., Post Forester, U. S. Army, Ft. Campbell, Ky.; Iowa State, B.S.F., 1953.

New England Section

Student Grade

UNIVERSITY OF MASSACHUSETTS

Knudston, E. L.
McCaskie, D. G.
Percy, T. F.
Rivers, R. J.
Schruender, B. J.
Whittaker, B. J.

Affiliate Grade

Rheinlander, J. R., Forester, St. Regis Paper Co., Bucksport, Me.

Vassitis, A. J., Millman, Aeolian-Skinner Organ Co., Dorchester, Mass.

Northern California Section

Junior Grade

Peterson, E. J., Dist. Forester, Bur. of Land Mgmt., Sacramento, Calif.; Iowa State, B.S.F., 1949.

Northern Rocky Mountain Section

Student Grade

MONTANA STATE UNIVERSITY

Boll, L. A.
Paul, G. D.
Rouse, C. E.
Royce, A. G.

Junior Grade

Evancoe, E. J., Earth Moving Engineer, Caterpillar Tractor Co., Billings, Mont.; Univ. of Mich., B.S.F., 1943.

Affiliate Grade

Russell, R. M., Woods Foreman, J. Neils Lbr. Co., Troy, Mont.

Ozark Section

Student Grade

UNIVERSITY OF MISSOURI

Arter, J. S.
Bell, L. W.
Berlin, J. S.
Carron, S. T.
Cole, A. B.
Eckles, G. W.
Ferell, R. S.
Ferguson, A. J.
Ferrill, M. D.
Fisher, H. E.
Gwinner, M. W.
Hawkens, R. H.
Keyth, W. A.
Post, A. J.
Prante, H. J.
Schaller, G. T.
Schneider, G. E.
Slusher, J. P.
Strauss, R. J.
Strickler, J. K.
Tamm, J. N.
Tree, C. R.
Troutt, A. H.

Affiliate Grade

Lewis, N. E., Dist. Forester, Dierks Forest, Inc., Broken Bow, Okla.; Okla. A & M, B.S., (Forestry), 1951.

Sheiron, L. S., Self-employed, Forestry Consultant, Monticello, Ark.; Ark. A & M, B.S., (Forestry), 1951.

Puget Sound Section

Student Grade

UNIVERSITY OF WASHINGTON

Chan, G. E.
Franklin, R. M.
Lusignan, G. R.
Magill, A. W.
Pickets, W. N.

Junior Grade

Darling, C. M., Forester, Twisp Wagner Lbr. Co., Twisp, Wash.; Oregon State, B.S.F., 1940.

Groben, M. M., Forester, Lewis River Div., Harbor Plywood Corp., Aberdeen, Wash.; Penn. State, B.S.F., 1951; Univ. of Wash., M.F., 1953.

Morrison, F. M., Dist. Ranger, U.S.F.S., Packwood, Wash.; Oregon State, B.S.F., 1941.

Sharpe, G. W., 4304 34th N.E., Seattle, Wash. Reinstatement.

Telford, R. C., Woodlands Mgr., Columbia Cellulose Co., Prince Rupert, B.C., Canada; Univ. of Wash., B.S.F., 1939.

Affiliate Grade

Cambrin, A. M., Forester, Columbia Cellulose Co., Ltd., Terrance, B.C., Canada; Univ. of B. C., B.S. (Forest Eng.), 1949.

Kolasinski, T. A., Land Examiner, Weyerhaeuser Timber Co., Raymond, Wash.

Waldie, W. F., Forester-in-Training, Celgar Dev. Co., Ltd., Castlegar, B.C., Canada; Univ. of B.C., B.S., (Forest Eng.), 1952.

Southeastern Section

Student Grade

ALABAMA POLYTECHNIC INSTITUTE

Brown, J. E.
Eisenhart, D. W.
Logan, J. B.
Morris, R. L.
Jones, W. E.
Rowe, E. E.
Whitlock, G. W.

UNIVERSITY OF FLORIDA

Eubank, G. H.
Gift, R. F.
Haynes, C. W.
Hemingway, H. M.
Leetch, T. A.
Messerly, W. H.
Phillips, H. J.
Royal, W. J.
Sage, R. D.
Sands, J.

UNIVERSITY OF GEORGIA

Astin, J. S.
Barbaree, J. A.
Barber, B. P.
Crumpton, D. N.
Davis, W. C.
Dillard, B. M.
Fowler, O. S.
Greene, J. P.
Johnson, S. G.
Layson, A. W.
Ray, W. G.
Roberts, C. D.
Roberts, M. N.
Shuman, S. E.

Junior Grade

Beal, J. F., Field Asst., International Paper Co., Bronson, Fla.; Univ. of Fla., B.S.F., 1952.

Jones, C. B., Field Rep., Dixie Wood Inc., Milledgeville, Ga.; Univ. of Ga., B.S.F., 1948. Reinstatement.

Kelly, A. W., 716 S. Orleans Ave., Tampa, Fla. Reinstatement.

Sparkman, W. L., Dist. Forester, Interstate Land & Improvement Co., Lumpkin, Ga.; Univ. of Fla., B.S.F., 1950.

Weaver, W. J., Forester, Jeffreys-McElrath Mfg. Co., Macon, Ga.; Univ. of Fla., B.S.F., 1950.

Southwestern Section

Affiliate Grade

Hill, A., Forester, U.S.F.S., Capitan, N. Mex.; Okla. A & M, B.S., (Forestry), 1952.

Upper-Mississippi Valley Section

Student Grade

IOWA STATE COLLEGE

Breon, D. G.
Gill, R. B.
McIntyre, V. L.
Prey, A. J.
Schwarte, M. K.
Ter Louw, J. W.
VanDeusen, J. L.

UNIVERSITY OF MINNESOTA

Manly, R. J.
Peters, W. J.
Peterson, B. G.
Salzman, J. A.
Schnack, C. D.
Schroeder, D. B.
Waring, R. H.
Williams, R. W.

Junior Grade

Cedergren, J. H., Forester, The Northwest Paper Co., Cloquet, Minn.; Univ. of Minn., B.S.F., 1948.

Affiliate Grade

Rounds, B. W., Supv., U. S. Fish & Wildlife Service, Minneapolis, Minn.; Colo. A & M, B.S. (Forest & Game Mgmt.), 1948.

Wisconsin-Michigan Section

Student Grade

MICHIGAN STATE UNIVERSITY

Colby, G. A.
Hoffman, L. W.
Langguth, R. C.
Wildenberg, R. J.

UNIVERSITY OF MICHIGAN

Gerardo, M.
Jones, D. R.
Jordan, C. F.
Kraus, J. F.
Kuehl, T. R.
Lohrey, R. E.
Scharf, R. M.

Junior Grade

Arnold, F. M., Agent, Equitable Assurance Society of U. S., Ann Arbor, Mich.; Mich. State, B.S.F., 1939.

Lehmann, W. A., Dist. Forester, Mich. Dept. of Cons., Sault Ste. Marie, Mich.; Univ. of Mich., B.S.F., 1943.

Foreign

Honorary Member

Ranganathan, Shri C. R., Inspector general of Forests of India, Delhi, India; Oxford Univ., B.A.; Univ. of Madras, M.A.

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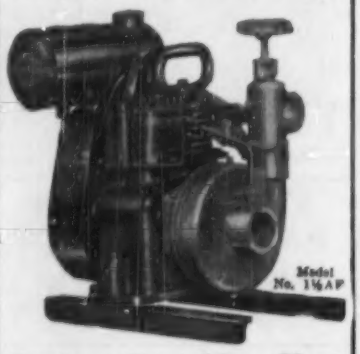

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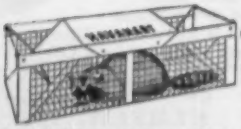

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Forestry News

California Forest Fire Disaster

Forest fires burned a staggering total of 307,000 acres of timber, watershed, and recreational lands in California between August 27th and September 13th, DeWitt Nelson, state director of natural resources, reported at Governor Knight's September Council meeting in Sacramento.

"This was the most critical fire weather period in 25 years," Nelson stated. "Tinder dry fuels, extreme temperatures, adverse wind conditions and a large number of fires started by lightning and by careless forest users and residents combined to produce a devastating series of fires in all parts of California.

A field survey completed by the state forester and the regional forester of the U. S. Forest Service placed commercial timber losses during the 18 day period at one and one quarter billion board feet, Nelson reported. "This volume of timber represents about one fourth of California's annual lumber production and, only six states in the nation produce more lumber in an entire year" Nelson said. The value of this volume of lumber at wholesale prices would be in excess of $100,000,000. Plans are already under way by lumbermen and the U. S. Forest Service to salvage as much of the burned timber as possible from private and federally owned lands, but seedlings and young trees were killed outright on more than 125,000 acres.

Although the state and federal forest agencies could not place a dollar figure on watershed loss, they estimated a potential damage of more than $6,000,000 alone as a result of one fire that burned 72,000 acres in the Santa Ynez Mountain watershed north and west of the city of Santa Barbara. In addition to timber and watershed damage, the survey estimated property losses including homes, buildings, equipment, and other physical property, at $3,800,000. The fires restricted recreational business and retarded timber production and other business activities in many areas.

The field survey showed 436 forest fires started during the August 27-September 13 period on the fifty million acres of foothill and mountain land protected by the California Division of Forestry and the U. S. Forest Service. Fifty-nine of these fires were caused by lightning but 377 were man caused. Local people living and working in or near the forest areas were responsible for two-thirds of the man caused fires and valley and urban residents accounted for one-third. Careless use of cigarettes and matches lead the list of man caused fires. Other causes included incendiary fires, fires started by hunters and fishermen, debris burning, children playing with matches, burning structures, lumber operations, camp fires, and railroads in that order. Nine out of every ten fires that started during the period were suppressed before reaching 300 acres in size. Forty one fires exceeded 300 acres and accounted for over 300,000 of the total acreage burned. At the peak of the fire siege on September 10th, over 14,000 men, 550 bulldozers and 3,000 fire fighting, supply and service vehicles were on the fire lines. The state and federal forest agencies spent more than $3,500,000 of emergency money in controlling the fires.

In the face of these staggering losses Nelson noted significant encouraging facts. Considering the hundreds of thousands of people using the foothill and mountain regions during the period, the number of fires proves that most people were careful. The press, TV, and radio vigorously alerted people to the hazards, and business, industrial, and organizational groups engaged in summerlong preventative campaigns. Contributions of manpower and equipment were generously given by the forest industry, utility companies, ranchers, and persons in all walks of life. Without this help, Nelson stated, losses would have been much greater.

Teton Wilderness Area Established in Wyoming

More than half a million acres within the Teton National Forest in western Wyoming has been designated as the Teton Wilderness Area by the U. S. Department of Agriculture.

The new wilderness area, comprising 563,000 acres, was established October 10 by order of Assistant Secretary E. L. Peterson. The action was taken on recommendation of the Forest Service, following discussions of the proposal with local interested groups during the past year.

Teton Wilderness Area straddles the Continental Divide and is adjacent to Yellowstone National Park. It will be

managed so as to preserve its natural primitive conditions. The area is extensively used by recreationists who prefer back-country wilderness unmodified by artificial influences.

There are now nearly 80 areas totaling more than 14,000,000 acres within the national forests which the Department of Agriculture has set aside for preservation as wilderness.

Forest Fire Damage Ruling

A United States Court of Appeals has ruled that a timberland owner, Rayonier, Inc., may not recover from the federal government for damages caused by failure of the U. S. Forest Service to extinguish completely a forest fire which had spread to Rayonier land from an adoining national forest. The action was brought under the Federal Tort Claims Act. The appeals tribunal cited the Texas City explosion case in which the courts ruled that carelessness by public firemen did not give private parties a right of action. The appeals court held that in the Rayonier case, U. S. forest rangers were acting in the capacity of public firemen. (*The Lumber Letter—September 16, 1955.*)

National Conference on FAO

Representatives of 26 nongovernmental organizations attended the National Conference on FAO which met at the University of Maryland, October 12, 1955. This conference, made up of some 60 organizations interested in the Food and Agriculture Organization of the United Nations, meets annually to consider FAO's regular and technical assistance programs and desirable trends, especially from the point of view of the United States.

FAO has completed ten years of service to its member nations, dealing directly with the immediate and long-term problems of food, agriculture, forestry, and fisheries. Member governments have increased from 42 to 71. Funds available for the regular program have grown to $6 million and for direct technical assistance to underdeveloped countries to $7½ million.

The program of the Conference consisted of four main parts: (1) A discussion of points of interest to the United States in the forthcoming Eighth Session of the FAO Conference in Rome. (2) A panel discussion relating to general agricultural policy, production, consumption and commodity problems, as well as the general FAO program and budget level for 1956-1957. (3) A luncheon meeting at which Assistant Secretary of Agriculture Earl L. Butz discussed "U. S. Agriculture and FAO." And (4) an afternoon panel discussion on the "Role of FAO."

Special panels planned for specific discussions of FAO's programs for forestry, nutrition, and fisheries were called off to make possible consideration of these features as a part of the overall program of FAO.

No decisions were called for. The main emphasis in the discussions brought out the advisability of giving greater consideration to problems of surplus agricultural commodities and especially to better distribution and increased consumption in many coun-

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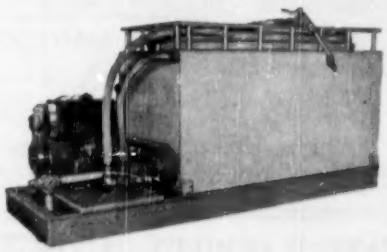

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tries; the need for continuing and gradually expanding the present programs relating to more efficient production, harvesting and conserving of the products of farms, forests, and waters; the necessity of better nutrition for the vast numbers of underfed people; the use of atomic energy in agriculture; and ways and means to bring about better coordination of the technical assistance programs of specialized agencies of the UN, such as FAO, WHO, UNESCO and UNICEF, so as to make most effective FAO's work on agriculture, forestry, and fisheries.

In forestry the past ten years have seen the initiation and notable progress on a well conceived world-wide FAO program. A strong staff has been built up in Rome, the central headquarters, for collection, evaluation and dissemination of information and the giving of advice and guidance to FAO member governments as requested. Cooperation in many aspects of the protection and conservative management and use of forest resources has been developed among nations, especially through the four regional Forestry Commissions and such technical commissions as the International Poplar Commission, which meet periodically. Through surveys of the world's forest resources, yearbooks of forest products statistics, *Unasylva*—a monthly world forestry magazine—and numerous technical bulletins, information of value to all countries is being disseminated.

Forestry specialists are studying the problems of underdeveloped countries under the Technical Assistance Program, particularly relating to possibilities for efficient use of forests and related "wild lands," rehabilitation of depleted forest, range, and watershed resources, sound development of forest industries, and other phases of forestry. This assistance goes beyond collecting information and advising governments in forestry and timber production into such features as study tours, training centers, the promotion of forestry research and training institutes, and the establishment of "pilot plant" tests of methods and practices adaptable to specific conditions.

All this is having a far-reaching benefit by improving living standards of the people of individual countries. Perhaps of even greater importance is its influence in better mutual understanding, not only of international forestry problems but also of the thinking of peoples on broader questions which will increase the possibilities for peaceful world development.

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TREE FARM Award is presented to Champion-International Company of Lawrence, Massachusetts, at the annual meeting of the Society for the Protection of New Hampshire Forests. *Left* to *right* are: Henry C. Waldo, chairman of the Granite States Forest Industries Committee; Richard V. Ashton, superintendent of the Woodlands Division of Champion-International Company; William C. MacAdam, assistant treasurer of Champion-International Company; and William P. House, chairman of the Tree Farm Committee. Mr. House commented in making the presentation "that this company, in addition to providing an important and needed hardwood market in southern New Hampshire, has on its own lands successfully pioneered in management of hardwood forests." (*Photo by Bob Duncan, North Conway, N. H.*)

Albert Ernest Receives FFA Award

An Honorary State Farmer degree was given by the Florida Association, Future Farmers of America, to Albert Ernest, vice president of St. Regis Paper Company and director of its southern forestry program. St. Regis was cited for its sponsorship of an annual contest in forestry between Florida FFA chapters, support of the FFA Forest Camp, and establishment of school forests for FFA chapters, now being undertaken.

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St. Regis Paper Company Awards Scholarships

St. Regis Paper Company's forestry scholarships presentations for the southern area were made on Monday, October 3rd, at the 80th annual meeting of the American Forestry Association in Jacksonville, Fla., by Edward R. Gay, executive vice president of St. Regis.

St. Regis awards three undergraduate scholarships in the South, and one each in the Northwest and Northeast for a period of two years to an outstanding Junior student at each of the participating schools. A Fellowship in Forestry was awarded earlier this year.

The scholarships in the South are provided, one each, at Alabama Polytechnic Institute, the University of Florida, and the University of Georgia. Scholarship winners in the South were chosen by a committee composed of Regional Forester Charles Connaughton of the U. S. Forest Service at Atlanta, Georgia; C. Huxley Coulter, Florida state forester; and Albert Ernest, St. Regis vice president in charge of southern woodlands operations.

The winners of the southern scholarships are: Harold H. Coan, Alabama Polytechnic Institute; William R. Mackay, University of Florida; Arthur N. Palmer, University of Georgia.

The scholarship winner in the Northwest is Nils A. Arneson, Jr., a student at the University of Washington. He was chosen by a committee consisting of U. S. Regional Forester J. Herbert Stone; Robert Cowlin, Director of the U. S. Forest Experiment Station at Portland, Oregon; and J. M. Lamb, resident manager of the St. Regis mill at Tacoma, Washington.

In the Northeast, the St. Regis scholarship winner is Norman A. Richards, a student at the State University of New York. The Northeast scholarship committee was composed of U. S. Regional Forester Charles Tebbe, Philadelphia, Pa.; Ralph Marquis of the U. S. Forest Experiment Station, Upper Darby, Pa.; and Paul M. Dunn, St. Regis Technical Director of Forestry.

St. Regis offers each of the undergraduate scholarship winners employment during the intervening summer on some forestry project. Their continuance as recipients during the senior year will depend upon their records in the field as well as in school.

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American Forestry Association

Some 300 members and guests of the American Forestry Association held a successful meeting in Jacksonville, Fla., October 3-6.

A highlight of the sessions was the presentation of distinguished service awards in various fields of conservation. Each recipient was given a plaque and a life membership in the association.

Prof. G. B. MacDonald of Ames, Iowa received the award for education.

Perry H. Merrill, state forester of Vermont, received the award for public service.

William P. Wharton of Groton, Mass. was honored for general service to conservation.

J. P. Weyerhaeuser of Tacoma, Wash. received the industry award; and Earl W. McMunn, editor of the

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Ohio Farmer, Rocky River, Ohio, received the award for public information.

The awards were presented by Robert N. Hoskins, chairman of the A.F.A. Awards Committee, Norfolk, Va.

New Officers Elected Natural Resources Council

At the annual meeting of the Natural Resources Council of America, held in Silver Springs, Fla., October 6, the following officers were elected to serve one year.

Chairman, David R. Brower of the Sierra Club, San Francisco.

Vice chairman, Charles H. Callison of the National Wildlife Federation, Washington, D. C.

Secretary, C. R. Gutermuth of the North American Wildlife Federation, Washington, D. C.

Treasurer, Harry E. Radcliffe of the American Nature Association, Washington, D. C.

Additional members of the executive committee are Lowell Besley of the American Forestry Association, Fred M. Packard of the National Parks Association, and Edward H. Graham of the Soil Conservation Society, all of Washington, D. C.

National Conference on Water Resources Policy to be Held

A national conference on water resources policy will be held in St. Louis next January 24 and 25 as a step toward conservation of the country's water supplies, the Chamber of Commerce of the United States has announced.

The assembly of authorities on the nation's water problems will be sponsored by the Chamber, in cooperation with the Engineers Joint Council and the National Water Conservation Conference.

Among problems receiving special attention will be the need for a unified, comprehensive national water policy in which the roles of government, business, and citizens' organizations will be clearly spelled out.

The conference will examine reports of the Hoover Commission, the President's Cabinet Committee on Water Policy, the Commission on Inter-governmental Relations, and others.

Speakers will include Boyd Campbell, president of the National Chamber; Admiral Ben Moreell, USN, Ret., chairman of the board, Jones and Laughlin Steel Corp., Pittsburg; and members of Congress, the Administration and the Hoover Commission.

The Chamber pointed out that recent floods and droughts have underscored the need for coordinated planning to assure better water conservation and flood control measures at reasonable costs.

Association Executives Elect Officers

New officers of the Council of State Forestry Association Executives were elected at Jacksonville, Fla., on October 3. New president is M. N. Taylor, executive director of Trees for Tomorrow, Inc., Merrill, Wisc.; new secretary, Alfred M. Williams, secretary, Massachusetts Forest and Park Association, Boston. Next year's meeting of the Association will be held in Richmond, Va. during the fall with William E. Cooper, executive director of Virginia Forests, Inc., as program chairman.

Frank W. Wentworth Deceased

Frank W. Wentworth, notable conservationist, who died in Berkeley, California, on October 13, 1955, was vice president of the Save-the-Redwoods League, and chairman of the Finance Committee of that organization. He was instrumental in securing large contributions for preserving the finest of the Redwoods of the Coast and Sierra.

A member of the Save-the-Redwoods League since 1921, he helped to pioneer the early activities of the conservation group. He became a councilor of the League in 1927, and a director in 1929, serving on the Board continuously in the following quarter-century. He had been vice president since 1951.

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Forest Research in Northwest Reviewed

The September 1955 issue of the *Oregon Historial Quarterly* carries an article prepared by Thornton T. Munger entitled "Fifty Years of Forest Research in the Pacific Northwest." An interesting and informative history of a half-century of research is presented for the Forest Service and cooperating agencies in this vitally important forest region.

Forestry Employment

S.A.F. members are privileged to insert one 60-word advertisement in this column without charge. Forest industries desiring to employ foresters may insert advertisements at the rate of $4 per column inch. Copy must be received by the end of this month for an advertisement to appear in the issue after next.

Obviously, the Society cannot assume responsibility beyond making it possible for prospective employee and employer to enter into negotiations.

Positions Available

Consulting firm covering South wishes to contact specialist trained and with some experience in technical report writing, statistical analysis, and forest management, inventory techniques, (including IBM adaptations) and economics. Principal duties to coordinate technical field work of staff, write management plans, improve technical techniques and accuracy, and supervise office computations. Position believed to offer challenge, opportunity, and potential for qualified candidate.
Box D, Journal of Forestry, Mills Building, Washington 6, D. C.

Wanted, by Jefferson County (Kentucky) Forest Commission, forester to manage 3,000-acre county forest and handle related recreation and educational work. Annual salary about $5,000. Apply to Chairman, Jefferson County Forest Commission, Fiscal Court Building, Louisville 2, Ky.

Positions Wanted

Forester, B.S. 1951; married, 2 children; presently with U. S. Forest Service as Engineer; desires to locate in Lake States with firm dealing in forest products. Experience includes 6 seasons small logging operations in Michigan; 2 years forest product inspection with national firm, including knowledge of wood treating operations; 2 years wood utilization; 3½ years naval service.
Box E, Journal of Forestry, Mills Building, Washington 6, D. C.

Forester, 34, B.S.F. and M.S. Currently employed by the U. S. Navy developing forest management and utilization programs. Desires employment overseas, in the same type work, particularly in South or Central America.
Box F, Journal of Forestry, Mills Building, Washington 6, D. C.

Forester, B.S.F. 1951 N. Y. State. Attending university graduate school of business. Married. 26 years. 2½ years of practical selling experience with wholesale lumber company. Desires position in this field with greater advancement opportunity.
Box G, Journal of Forestry, Mills Building, Washington 6, D. C.

Education

Professor Guise Honored

Cedric H. Guise recently received a Persian (Kerman) rug from Abe George, representing Cornell Forestry Alumni, in honor of his 40 years as teacher of forestry at Cornell University. "Ced" began his service in the Department of Forestry in 1914 as an assistant and retired on July 1, 1954.

The gift was a presentation from the men and one woman who were students and professional foresters when the department existed for professional work. Classes represented covered years of graduation from 1911 to 1936. "Ced" is himself, a Cornell forester of 1914. He remains active in both community and professional work.

L.S.U. to Hold Conference on High-Speed Computers

The third Conference on High-Speed Computers will be held at Louisiana State University, Baton Rouge, La., February 15-17, 1956. This conference is open to potential users from all sections of the country.

Topics scheduled for discussion by nationally recognized speakers include office procedures, statistical operations, and numerical methods designed for the adaptation of problems to machine solution. Several manufacturers of computing equipment will be represented through exhibits or demonstrations of computers in operation.

Inquiries concerning the conference may be directed to William C. Hopkins, Assoc. Professor, School of Forestry, Louisiana State University, Baton Rouge, La.

Harlow Film Wins Photographic Award

Dr. William M. Harlow's film "Insect Catchers of the Bog Jungle" was chosen as the best nature film of 1955 by the Photographic Society of America at their International Exhibit of Photography, held in October in Boston. The award is known as the Dick Bird Nature Trophy.

Dr. Harlow, professor of wood tech-

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DR. WILLIAM HARLOW, Professor of Wood Technology, State University of New York College of Forestry in Syracuse, shown with trophy awarded him by Photographic Society of America. The award was for the best nature film of 1955.

nology at State University of New York College of Forestry in Syracuse, is well known for his outstanding time-lapse photography. He is a contributor to Walt Disney's True Life Adventure Series, and producer and collaborator for Encyclopedia Britannica Films. Earlier this year "Insect Catchers of the Bog Jungle" won the Golden Reel Award of the Film Council of America.

"Insect Catchers" is a ten-minute, sound-color, 16mm. film, featuring the pitcher plant, sundew, and Venus flytrap. These plants are highly colorful, and when greatly magnified on the screen, they provide an unparalleled spectacle. Their actions in trapping live insects border on the fantastic, especially when shown in close-ups with the time-lapse camera. Several of Darwin's experiments with the sundew, never before recorded on color film, are shown.

E. V. Hunt, Jr. Joins Stephen F. Austin State College Staff

Ellis V. Hunt, Jr., Knoxville, Tenn., was named assistant professor of forestry at Stephen F. Austin State College, Nacogdoches, Texas, effective September 1, 1955.

Since 1950, Hunt had been a forestry research assistant for the University of Arkansas and an assistant professor of forestry at the University of Tennessee.

Hunt did his undergraduate college work at the University of Missouri and received his M.S. degree in forestry from the same institution in 1952.

At Stephen F. Austin State College he will handle work in mensuration, logging and sawmilling, farm forestry, and forestry research.

OSC Starts Research on Insecticides

Oregon State College has recently undertaken a new research project dealing with insecticides for control of the various damaging forest insects. The project is being sponsored by the Northwest Forest Pest Action Committee, the Oregon State Board of Forestry, OSC Forest Experiment Station, and OSC Department of Ento-

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mology. Preject leader is Dr. Julian Rudinsky. Various insecticides will be tested under laboratory conditions and the most promising pest killers will then be tested in the field. The object of the project is to avoid the costly delays in starting control programs that have occurred in the past because of insufficient knowledge of the most effective insecticides to use when insect outbreaks developed.

Public

Kentucky Forestry, Logging, and Sawmilling Show

The Kentucky Forestry, Logging and Sawmilling Show held recently near London, Ky., was termed an outstanding success by the sponsors, with the announcement that approximately five thousand persons attended the two-day show from all surrounding states and from as far away as Thailand and Malaya.

Forty-four exhibitors displayed more than one-half million dollars in equipment at the event which was intended primarily to demonstrate good forestry practices in order to perpetuate the forests and to produce higher quality and quantity timber.

Equipment displayed ranged from a small saw file to heavy crawler tractors and carry lifts. Four circular sawmills were in continuous operation with each mill assigned an individual logging chance. The operation was carried through a complete cycle beginning with tree-felling and ending with the rough lumber product. Special events included sawing, chopping, and volume-estimating contests.

Foresters of the Kentucky Division of Forestry, one of the cooperating agencies, were assigned to assist in the woods demonstrations, to answer technical questions, and to give a running account of the proceedings.

Sponsoring the show was the University of Kentucky Extension Service with the cooperation of the Kentucky Division of Forestry, U. S. Forest Service, Central States Forest Experiment Station, Columbus, Ohio; the London-Laurel County Development Association and other state and federal agencies.

Previous shows have been held in Ohio, Missouri, Indiana, and Illinois.

Record Payments Go to O. and C. Counties in Oregon

Fiscal year 1955 payments to the 18 counties of western Oregon entitled to share in receipts from sale of timber from revested Oregon and California Railroad grant lands totaled a record $9,000,379.92. This is more than $2 million higher than the 1954 total.

The payments represent 75 percent of the $15,333,839.89 total receipts from O. and C. 1955 timber sales less $2,500,000 allotted by the counties for constructing access roads to O. & C. timber.

In addition to O. & C. timber sale payments, Coos County also received a $43,227.13 payment for its share of receipts from sale of timber from Coos Bay Wagon Road grant lands, also managed by the Bureau of Land Management.

The record-breaking payments reflect higher bidding at auction sales and also a substantial gain of 29.5 million board feet in volume of timber sold. The 1955 volume total was 644.6 million board feet as against 615.1 million board feet in 1954.

C. E. Brown, M. L. Tedrow Assume New Duties

Carroll E. Brown, staff officer of the Gifford Pinchot National Forest, has been assigned to take charge of mining claims activities in the Division of Recreation and Lands in the Regional Office of the U. S. Forest Service at Portland, Ore. He has been replaced by Maurice L. Tedrow of the Rogue River National Forest.

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North Carolina Revises Its Long-Range Forestry Program

A long-range forestry program developed in 1950 by the North Carolina Forestry Council has been revised this year in recognition of the progress made since 1950. Principal plank of the program is adequate forest fire control, for which state appropriations of $1,082,000 are recommended; current expenditure is slightly in excess of $600,000. Other program recommendations include: intensified public education; continuation of technical assistance to forest owners, operators and industries; encouragement of the field of consulting forestry; merit retention and promotion of state forestry personnel; continuation of the state's seed tree law, but no legislation looking toward regulation of forestry practices on private lands; expansion of tree planting and nursery facilities; intensified forest pest control; increased research; a study of forest tax laws; encouragement of private forest credit and insurance; a small expansion of state forests, and placement of all forest lands owned by the state under the management of the Division of Forestry.

Forester Heads Missouri Park System

Joseph Jaeger, Jr., district forester with the Missouri Conservation Commission for the past ten years, has been appointed Director of the Missouri State Park System. He assumed his new position in October.

Jaeger is the first forester to hold this position which is filled through appointment by the bipartisan, six-member State Park Board. He is a 1942 graduate in forestry of Oregon State College and served with the U. S. Army 1942-1945, including duty in the Alaskan Theater.

Wildlife Vacancy Filled at Portland

Promotion of Dr. Walter O. Hanson, staff assistant on the Black Hills National Forest, to head wildlife activ-

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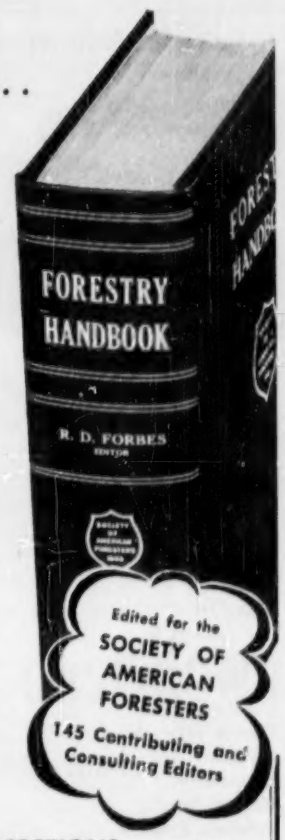

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ities in the Division of Wildlife and Range Management in the Pacific Northwest region of the U. S. Forest Service, became effective October 9, according to Regional Forester J. Herbert Stone. Hanson fills the vacancy caused by the promotion of William W. Huber to head the section of special programs and cooperative forest fire prevention in the Washington Office of the Forest Service.

Hanson first started work with the Forest Service in 1935. He received his B.S. degree in forestry from Utah State. He accepted a teaching fellowship at Louisiana State University while working for his master's degree from that institution. He received his doctor's degree from the University of Michigan.

He was in military service from July 1942 to June 1946.

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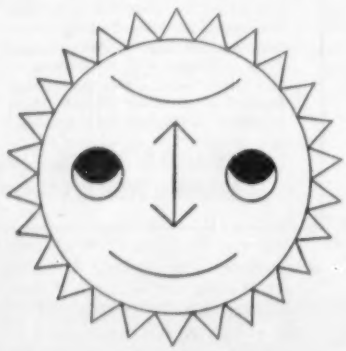

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Ivan H. Sims Transferred to Washington

Ivan H. Sims, formerly chief of the Division of Forest Management Research at the Northeastern Forest Experiment Station, Upper Darby, Pa., has been promoted to a post at the U. S. Forest Service's central office in Washington, D. C.

Sims has been named administrative assistant to V. L. Harper, assistant chief in charge of research. He succeeds W. L. Larrimer, of Washington, D. C., who has retired.

Sims had served as forest management chief at the Northeastern Station since 1948. In this position he guided the development of the federal forest research program now being carried on at research centers and experimental forests in the twelve northeastern states.

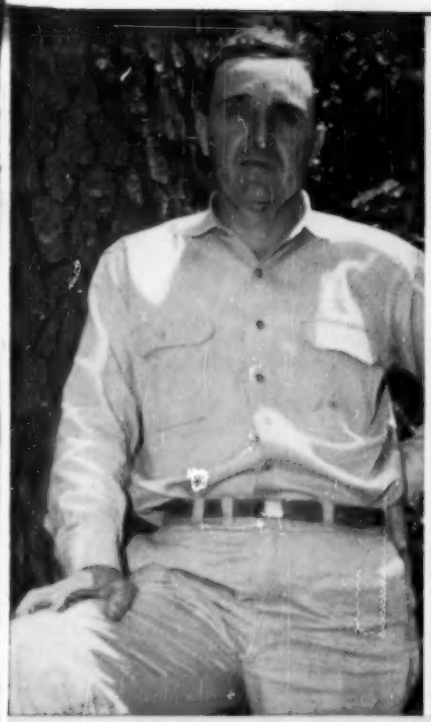
Forest Insect Work Strengthened at Southern Station

William H. Bennett has been appointed to take charge of forest insect surveys at the Southern Forest Experiment Station according to an announcement by Philip A. Briegleb, director of the station. He will serve as assistant to L. W. Orr, chief of the Division of Forest Insect Research and will work on developing an effective program for detecting and reporting forest insect infestations and applying control measures where necessary.

Bennett is a forestry graduate of Toronto University in Canada and received the M.S. degree in forest entomology at the State University of New York College of Forestry in 1937. Since then he has been teaching and conducting research at the College except for three years' service in the Army and six months during 1954 working for the Texas Forest Service in a survey of forest insect problems in that state.

John F. Coyne, who has been working on insect surveys for several years, is being placed in charge of a new program of research on insects affecting forest regeneration. He will remain at the Forest Insect Laboratory, Gulfport, Mississippi, but will devote most of his time to studies of insects that are important pests of forest tree seed and of young trees. Much of this work will be done at the Southern Institute of Forest Genetics, but some of his experiments will be conducted in plantations or natural stands in other areas.

City Zone State



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Packed with power, the new Homelite Model 5-20 Chain Saw brings down big trees six feet in diameter, cuts through 20" trees in 20 seconds without forcing or jamming. Anyone can operate it . . . no experience necessary.

Interchangeable Blades add versatility to the new Homelite 5-20 Chain Saw. For felling, bucking, limbing or plunge cutting, there's a hard track blade for every requirement. Straight blades available from 14" to 60", bow saws 14" and 18".

Bucking is easier on man and saw when a Homelite 5-20 goes to work. Takes less time than ever before. The 5-20 stands up under the grind on any job . . . job after job.

Underbucking takes less effort and is just as simple as bucking. The 5-20 is easy to handle upside down or in any position . . . and there's no loss of power.

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